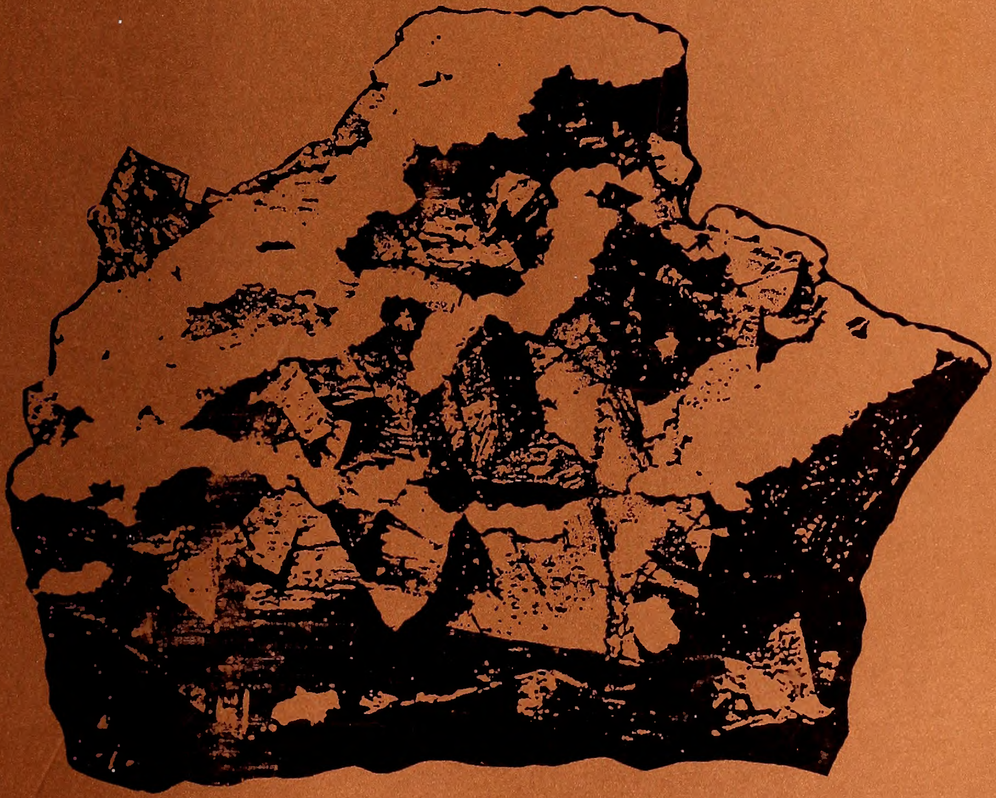
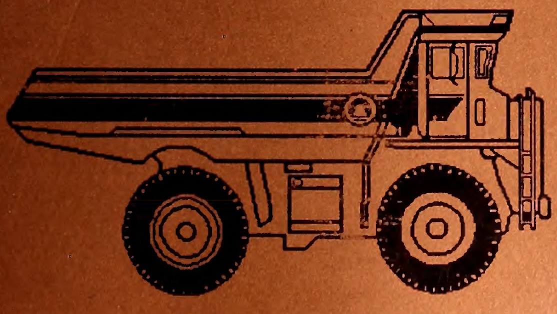
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Safford District Office

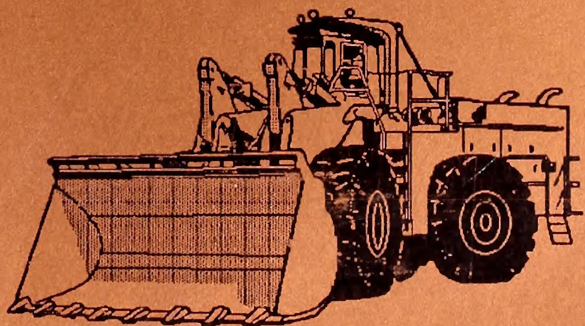
Gila Resource Area

December 1992

Final
Environmental Impact Statement
Sanchez Copper Project







The Bureau of Land Management is responsible for the balanced management of the public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based on the principles of multiple use and sustained yield, a combination of uses that will take into account the long-term needs of future generations for renewable and nonrenewable resources.

December 1992

BLM-AZ-PT-93-001-3000

IN REPLY REFER TO:

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
SAFFORD DISTRICT OFFICE
425 E. 4th Street
Safford, Arizona 85546

(602) 428-4040

3809 AZA 25564 (044)

December 1992

Dear Public Land User:

Enclosed is the Final Environmental Impact Statement (FEIS) for AZCO Mining Company's proposed Sanchez Copper Mine. This document describes their proposed plan of operations and reviews potential environmental and socio-economic impacts of the proposal. The mine would encompass approximately 1,400 acres of public lands 10 miles northeast of Safford, Arizona.

Publication of the Final Environmental Impact Statement is the result of a 17-month review process which included public meetings and opportunities for public input. Numerous additions were made in the environmental documentation and analysis of the project as a result of the public review process which accompanied release of the Draft Environmental Impact Statement in March 1992. For several years prior to the preparation of this Draft Environmental Impact Statement, extensive investigations were conducted by AZCO to determine potential impacts on various environmental and socio-economic factors. Various alternatives for reclaiming the lands after mining were also evaluated by AZCO.

The release of this Final Environmental Impact Statement begins a 30-day comment period. During this period, we encourage you to review the document and provide us with your comments about the proposal and the alternatives.

Written comments on the project will be accepted until January 19, 1993 Please send your comments to Larry Thrasher, BLM Project Manager, Safford District Office, 711 14th Avenue, Safford, Arizona 85546. Please note that this is a new address for our office.

We would like to thank all of you who have participated to date in the public participation for this project, and encourage your continued involvement through review of the Final Environmental Impact Statement. After the comment period closes, input will be reviewed for incorporation into the Record of Decision. We anticipate the Record of Decision will be released in January.

Within 30 days of receipt of the Record of Decision, you have the right of appeal to the Arizona State Director, Bureau of Land Management, in accordance with the regulations at 43 Code of Regulations 3809.4. If you exercise this right, your appeal, accompanied by a statement of reasons and any arguments you wish to present, which would justify reversal or modification of the decision, must be filed in writing with the BLM Safford District, 711 14th Avenue, Safford, Arizona 85546, within 30 days of receipt of the Record of Decision. Do not send the appeal directly to the Arizona State Office. The appeal and the case file will be sent to the Arizona State Office from the Safford District Office. You have the burden of showing that the Record of Decision appealed from is in error. The Record of Decision will remain in effect during the appeal unless a written request for a stay is granted.

Sincerely,

Margaret Jensen

Margaret L. Jensen
Gila Area Manager

Final

Environmental Impact Statement
Sanchez Copper Project

Prepared for

Bureau of Land Management
Safford District Office
Gila Resource Area
Safford, Arizona

Lester K. Rosenkrance

Lester K. Rosenkrance
Arizona State Director

Final

Environmental Impact Statement
Sanchez Copper Project

Lead Agency:	U.S. Department of the Interior Bureau of Land Management (BLM) Safford District Office Gila Resource Area Safford, Arizona
Third Party Contractor:	Fletcher Associates 17740 East Hinsdale Avenue Aurora, Colorado 80016 (303) 693-2516
Project Location:	Graham County, Arizona
Comments on this EIS should be directed to:	Larry Thrasher Project Manager Safford District Office Bureau of Land Management 425 East 4th Street Safford, Arizona 85546 (602) 428-4040

Abstract:

AZCO Mining Inc. proposes to develop the Sanchez Copper Project on mining claims administered by the BLM in Graham County, Arizona. The proposed action includes an open pit copper mine, with a heap leach and solvent extraction-electrowinning (SX-EW) processing, and a large waste rock disposal area. Approximately 200 million tons of ore will be processed, and approximately 200 million tons of waste rock will be placed in a disposal area. The project will affect approximately 1,400 acres.

The proposed operation will last for 17 years and will process about 12 million tons of copper ore each year, for an annual copper production rate of 25,000 tons. At full production, the project will employ approximately 210 people, with an annual payroll of $8.15 million. The mine and process facility will use 2,600 acre-feet of water per year from groundwater wells and pit dewatering.

This environmental impact statement (EIS) describes the proposed action, reasonable alternatives, the existing environment, and the environmental consequences of implementing the proposed Sanchez Copper Project or the alternatives. The alternatives analysis includes locations for access, heap leach pad configurations, alternative groundwater disposal techniques, reclamation techniques, partial backfilling of the pit, and the No Action alternative.

Table of Contents

List of Figures

List of Tables

TABLES, Continued

Preface

The Final Environmental Impact Statement (EIS) for the proposed Sanchez Copper Project is organized in a similar manner as the Draft EIS, i.e., the section and subsection numbering remains essentially the same. The Final EIS contains additions or revisions to certain sections of the Draft EIS. Sections which have been added in the Final EIS are indicated in redline form in the Table of Contents. Added or revised text in the body of the document is also indicated in redline form.

The following is a summary of the principal additions or revisions to the Draft EIS which are now included in the Final EIS.

1. The BLM reviewed the proposed action and reasonable alternatives and has selected preferred alternatives for implementation of the Sanchez Copper Project. The preferred alternatives are:

   - One heap leach pad and plant site, both located west of Head Canyon;
   - Access to the plant site from Solomon Pass Road; and
   - Excess pit water, if any, pumped to a reservoir for infiltration.

2. The hydrologic discussions and impacts in Sections 3.3 and 4.3 have been entirely revised. The principal changes occur in the expanded hydrology presentation based on additional data obtained since publication of the Draft EIS.

3. Comment letters from agencies and from the general public regarding the Draft EIS were received during the 60-day review period. These letters and corresponding BLM responses are presented in Section 5.5.

4. The Appendix section of the Final EIS has been expanded to present additional information requested by the public.

Summary

Introduction

AZCO Mining Inc. has proposed to develop the Sanchez Copper Project as an open pit mine and heap leach processing facility in Graham County, Arizona. The project is located about ten miles northeast of Safford on mining claims staked on public lands under the jurisdiction of the Gila Resource Area, Safford District Office of the BLM, Safford, Arizona. In August 1991, AZCO submitted a Plan of Operations to the BLM describing the mining, processing, existing environment, and reclamation. The BLM reviewed the proposal and determined that preparation of an EIS was necessary.

Purpose and Need

The purpose of this action is to mine and process copper ore from the Sanchez ore body. The need for this action is reflected in the relatively high price society places on copper, which is currently about $1.00 per pound.

Proposed Action

The Sanchez orebody will be mined using conventional open pit mining techniques and mining equipment. The planned ore mining rate is 12 million tons per year. Waste rock and alluvium will be mined at an average rate of about 13 million tons per year over the life of the mine. The final pit would measure approximately 4,000 feet in diameter and 1,200 feet in depth. It contains approximately 200 million tons of copper ore and approximately 200 million tons of waste rock. The mining schedule provides for a 17-year mine life, and approximately 210 people will be employed for the operation.

Ore from the pit will be transported to the crushing and screening plant prior to being conveyed to the leach pad. Crushed ore will be treated with a strong sulfuric acid solution and then will be rinsed with a weak sulfuric acid solution, producing pregnant leach solution which will be piped back to the processing facility. High-quality copper cathodes will be produced in a solvent extraction-electrowinning (SX-EW) plant, where copper is extracted from the pregnant leach solution, concentrated, and plated on stainless steel cathodes.

The proposed access to the project site will be primarily on existing paved roads. Total surface disturbance as a result of development is estimated at 1,400 acres. Coversoil will be stockpiled for later use in reclamation. Throughout the mine life, revegetation test plots will be established to evaluate plant species, soil suitability, fertilizer and amendment requirements.

The project will require approximately 1,600 gallons per minute of water for plant operations and dust control.

Agency-Preferred Alternative

The BLM reviewed AZCO's proposed action and developed reasonable alternatives to the proposed action. After further evaluation, the BLM developed a preferred alternative which is a modification of AZCO's proposed action.

In accordance with the Council on Environmental Quality (CEQ) guidelines (40 CFR 1502.14) for implementation of the National Environmental Policy Act (NEPA), the lead federal agency is required to identify its preferred alternative for the proposed project in the Draft or Final EIS. The BLM has defined the preferred alternative in the Final EIS after considering public comments received regarding the Draft EIS.

The BLM has reviewed the public comments, project components associated with the proposed action and alternatives, and various monitoring and mitigation measures which may be stipulated in the BLM's Record of Decision. Based upon these considerations, the BLM has selected the Agency-Preferred Alternative as described below.

Components of the project from the proposed action are:

- Sanchez open pit;
- Main waste dump and two small dumps to the north of the pit;
- Reclamation plan; and
- Conveyor corridor to main heap leach pad.

Components of the project from the alternatives:

- One heap leach pad west of Head Canyon;
- Plant site and ponds located south of the leach pad;

- Access to the project using both the Sanchez Road and the Solomon Pass Road;
- Excess groundwater disposal into a reservoir with infiltration; and
- Electrical power line utilizing existing right-of-way corridor.

The Agency-Preferred Alternative incorporates a modified alternative access route. A major concern of the residents along Sanchez Road was a significant increase in traffic to access the mine and processing plant. All operations traffic would have used Sanchez Road. Residents believed there were reasonable access alternatives, and they began dialogue among the BLM, county officials and AZCO to address the problem.

Following is a chronology of the access route issue.

- •1989 AZCO and county officials discussed use of existing Sanchez Road and problems with access and narrow road conditions.
- •1990 County filed a right-of-way application to re-route about one mile of Sanchez Road.
- •1990 BLM approved right-of-way, and construction commenced.
- •1991 August 2 - AZCO filed Plan of Operations, proposing to use Sanchez Road; local residents became concerned.
- •1991 August 28 - First public meeting to discuss proposed Sanchez Copper Project. Local residents voiced concern about significant increases in traffic on Sanchez Road.
- •1991 October 21 - Official Scoping Meeting for proposed project; the issue of access remained a primary concern.
- •1992 January 25 - U.S. Representative Jim Kolbe was present in Safford to discuss AZCO's proposed project and specifically the access issue.
- •1992 March - The Draft EIS was issued, with Sanchez Road as the proposed access; alternative access options from Solomon Pass Road were being considered.
- •1992 April 2 - BLM conducted a Public Meeting regarding the Draft EIS; access continued to be of concern, and local residents continued to advocate a different access route.

- •1992 April 27 - County officials held an evening public meeting with Sanchez residents. County presented proposal to improve Sanchez Road. Local residents expressed opinions that the proposed improvements were not adequate to prevent significant safety hazards and lifestyle changes. BLM determined that heavy truck traffic (including acid trucks) was the major concern. Engineering estimates were made for an alternative access road to the processing plant from Solomon Pass Road; estimated cost for an upgraded gravel road would be $300,000.

- •1992 June 1 - BLM hosted a public meeting to present alternative access proposal. A funding source was obtained and approved for upgrading Solomon Pass Road. AZCO will pay for construction of an access road from Solomon Pass Road to the processing plant. Because of access considerations, BLM rejected the proposed action regarding two heap leach pads, ponds and piping which could only be accessed from Sanchez Road. The alternative heap leach pad and plant site were selected on the west side of Head Canyon. Public was amenable to idea of splitting traffic, with most of the heavy trucks using Solomon Pass Road.

Project Alternatives

Section 2.2 of this Final Environmental Impact Statement presents a detailed discussion of alternatives. Alternatives to the proposed action, or components of the project, which were considered include:

- No Action alternative;
- Alternative access route;
- Alternative heap leach pad configuration;
- Alternative groundwater disposal techniques;
- Alternative reclamation techniques; and
- Alternative partial backfilling of the pit.

Alternatives which were eliminated from consideration and from detailed analysis include:

- Underground mining;
- Complete backfilling of the pit;
- Processing using mill and tailings;
- Waste rock disposal in Head Canyon; and
- Heap leach pad south of the pit.

Summary of Impacts

The following critical elements were considered in the review of environmental impacts. Because of their importance, they are listed separately.

CRITICAL ELEMENT AFFECTED?	YES	NO	CRITICAL ELEMENT AFFECTED?	YES	NO
Air Quality	√		T & E Species		√
Areas of Critical Environmental Concern		√	Wastes, Hazardous/Solid		√
Cultural Resources	√		Water Quality	√	
Farmlands, Prime/Unique		√	Wetlands/ Riparian Zones		√
Floodplains		√	Wild & Scenic Rivers		√
Native American Religious Concerns		√	Wilderness		√

Detailed information on potential impacts and mitigation measures is provided in Chapter 4, Environmental Consequences. The following is a brief summary of impacts associated with the proposed action and reasonable alternatives, listed by major resource.

Air Resources

The Sanchez Project would emit particulate matter and gaseous materials. The particulate emissions would comprise the principal impacts to air quality. The Arizona Department of Environmental Quality will evaluate the potential emissions and issue an air quality permit which requires air pollution controls. The permit will be issued if it is demonstrated that the emissions will meet state and federal standards.

Geology and Mineral Resources

Approximately 200 million tons of waste rock will be removed and placed in waste rock dumps north and east of the pit. Approximately 200 million tons of copper ore will be placed on a heap leach pad

and leached with a dilute solution of sulfuric acid. The pit will be about 4,000 feet in diameter and about 1,200 feet deep. The pit will not be backfilled, and copper will be removed from the ore in the heap leach for commercial sale.

Water Resources

The Sanchez Project will use groundwater for processing and dust control. The groundwater will be obtained from pit dewatering and from groundwater wells. Total water requirements average 1,600 gpm, with a range from 1,000 to 2,000 gpm.

The processing facilities are designed to minimize impacts to groundwater quality by using clay and synthetic liners, a leak detection system, and groundwater monitoring wells. There may be impacts to groundwater quality and quantity resulting from operation of the project. The Arizona Department of Environmental Quality will review the proposed action and issue a permit if it is demonstrated that the project incorporates best available demonstrated control technology in the operation.

Primary impacts to surface water would result from runoff from the disturbed areas. Diversion ditches and sedimentation ponds will be used to minimize impacts. No direct surface discharges from the processing facilities are planned. The operation will not use surface water from Bonita Creek or the Gila River for processing or dust control.

Soils

The project will impact about 1,400 acres. Coversoil will be salvaged where available and stockpiled for use in reclamation. Coversoil will be respread over approximately 765 acres of surface disturbance. Mitigation in the form of reclamation will reduce the impact of soil loss. Erosion control will further mitigate impacts to soil.

Vegetation

The project will impact about 1,400 acres of vegetation. No Threatened and/or Endangered species were identified on the project site. Revegetation is proposed for approximately 765 acres, which includes the top of the heap leach piles and waste rock dump. The 277-acre open pit will not be reclaimed. The cumulative and significant long-term impacts to vegetation and habitat loss will be mitigated through the reclamation programs. Adherence to strict BLM requirements for bonding of reclamation programs and completion of these programs will prevent cumulative or significant long-term adverse impacts to vegetation.

Wildlife

No Threatened and/or Endangered species are known to be present or were identified on the project site. Several candidate species of bats may possibly use the project area. AZCO has provided $2,500 for bat research in the area. Approximately 50% of a javelina herd forage area will be covered by the waste rock dump. The reclamation plan will provide suitable mitigation, and there will be no cumulative or significant adverse impacts to wildlife.

Land Use

A significant change to the land use will occur due to the 277-acre open pit. The project will not impact wilderness, scenic rivers, or Areas of Critical Environmental Concern.

Cultural Resources

The cultural resource survey identified 38 sites in the project area. A mitigation program has been approved, and its implementation will be a requirement of permit approval. All cultural sites identified in areas to be disturbed will be removed or destroyed. Mitigation of impacts to cultural resources is discussed in Section 4.8.4 and in Appendix G - National Historic Preservation Act Compliance.

Aesthetics

The project will change the appearance of the area. New land forms from the heap leach piles and the waste rock dump will create new topography. The project area is classified as a Visual Resource Management Class IV area, which allows for major modification to the topography. The Scenic Quality of the area is "C", which indicates low sensitivity, background.

Socioeconomics

The socioeconomic impact to the area will be beneficial. The project will provide 210 new jobs to the Safford area. The annual payroll will be approximately $8.15 million. The Safford area has a surplus labor market, and the company will hire local, skilled individuals and will develop training programs.

Transportation

The highways into Safford are adequate to absorb the additional traffic. There are existing county roads to the project site, and two separate access routes will be incorporated which utilize both Solomon Pass Road and Sanchez Road. The company has projected an increase of 118 vehicles per day, which includes employees, supplies and finished copper transport.

Cumulative Impacts

The cumulative impact analysis was completed in each section of the critical resources (air, geology, hydrology, soils, vegetation, wildlife, land use, cultural resources, aesthetics, socioeconomics and transportation). Other activities which add to the cumulative impacts include the Dorothy B. Placer Mine, potential development of Phelps Dodge deposits, prison expansion, Mt. Graham Project, and closure of four landfills. In the foreseeable future, only the Phelps Dodge development of the Lone Star deposit (about four miles west of Sanchez) would have significant, cumulative impacts on critical resources; however, a firm time schedule for commencement of operations for the Lone Star Deposit has not been developed.

1.0 Introduction

This Final Environmental Impact Statement (EIS), prepared in compliance with the National Environmental Policy Act (NEPA) of 1969, describes the environmental impacts of AZCO Mining Inc.'s (AZCO) proposed action for the Sanchez Copper Project. AZCO prepared and submitted a Plan of Operations to the Gila Resource Area Office, Safford District, of the U.S. Bureau of Land Management (BLM) describing the access route, the open pit mine operation, heap leach processing, and waste rock dump construction. The proposed Sanchez Copper Project is in conformance with the approved Safford District Resource Management Plan (RMP), which provides for mining operations in this area. The following sections describe the project's location, the purpose and need for the federal action, and the scope of the Final EIS.

1.1 Project Location

The Sanchez site is located at the southeast end of the Gila Mountains in Graham County, Arizona, approximately 10 miles east-northeast of the city of Safford. Figures 1-1 and 1-2 illustrate the regional location of the project site. Access to the site is along existing paved roads and bridges which cross the Gila River. After crossing the river, the processing plant employees, acid trucks, and other vehicles requiring access to the processing area will use the Solomon Pass Road and a new access road constructed from the Solomon Pass Road to the processing plant. Mine workers, crushing plant workers, and vendors will use Sanchez Road to access the mine area.

The operator of the Sanchez Copper Project will be AZCO Mining Inc. (AZCO), a Colorado Corporation, whose address is 165 S. Union Blvd., Lakewood, Colorado, 80228. All proposed development will occur on unpatented mining claims and millsite claims located on federal lands administered by the BLM. The claim group is composed of 307 lode mining claims and 274 millsite claims in the Lone Star Mining District. AZCO acquired the rights to certain claims from Harold F. and Tillie Lou Carpenter, William W. and Loraine R. Sorsen, Hearold and Charleen Elmer, and Harold D. and Doris H. Maryott, locators, and has staked additional mining claims to complete AZCO's coverage of the project area.

The claims are located in Sections 21, 22, 23, 24, 25, 26, 27, 28, 29, 33, 34, 35, and 36, T6S, R27E; Section 4, T7S, R27E; and Sections 19, 30, and 31, T6S, R28E; Gila and Salt River Base Meridian. Total area contained within the claims is approximately 6,700 acres.

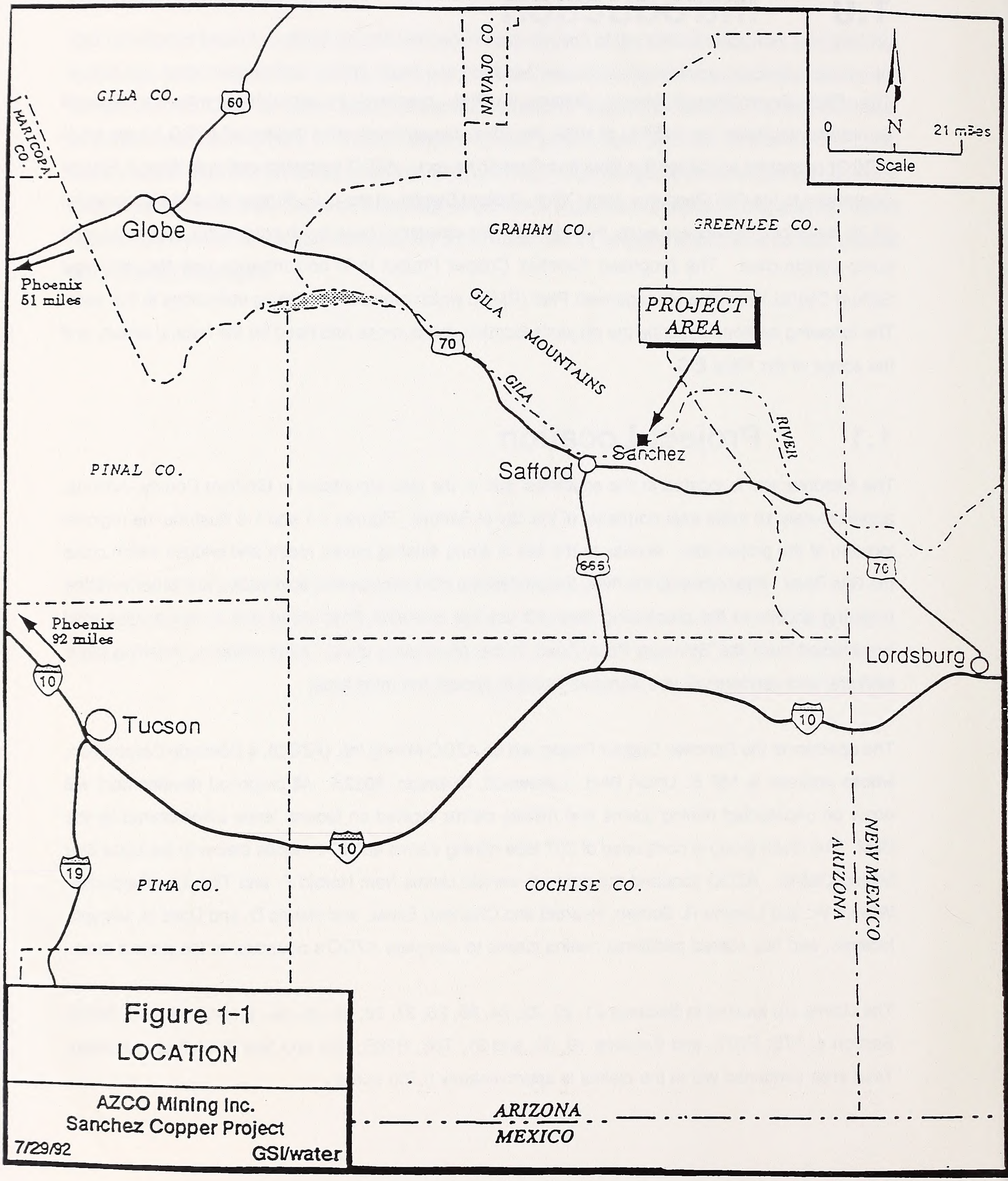


Figure 1-1
LOCATION

AZCO Mining Inc.
Sanchez Copper Project
7/29/92 GSI/water

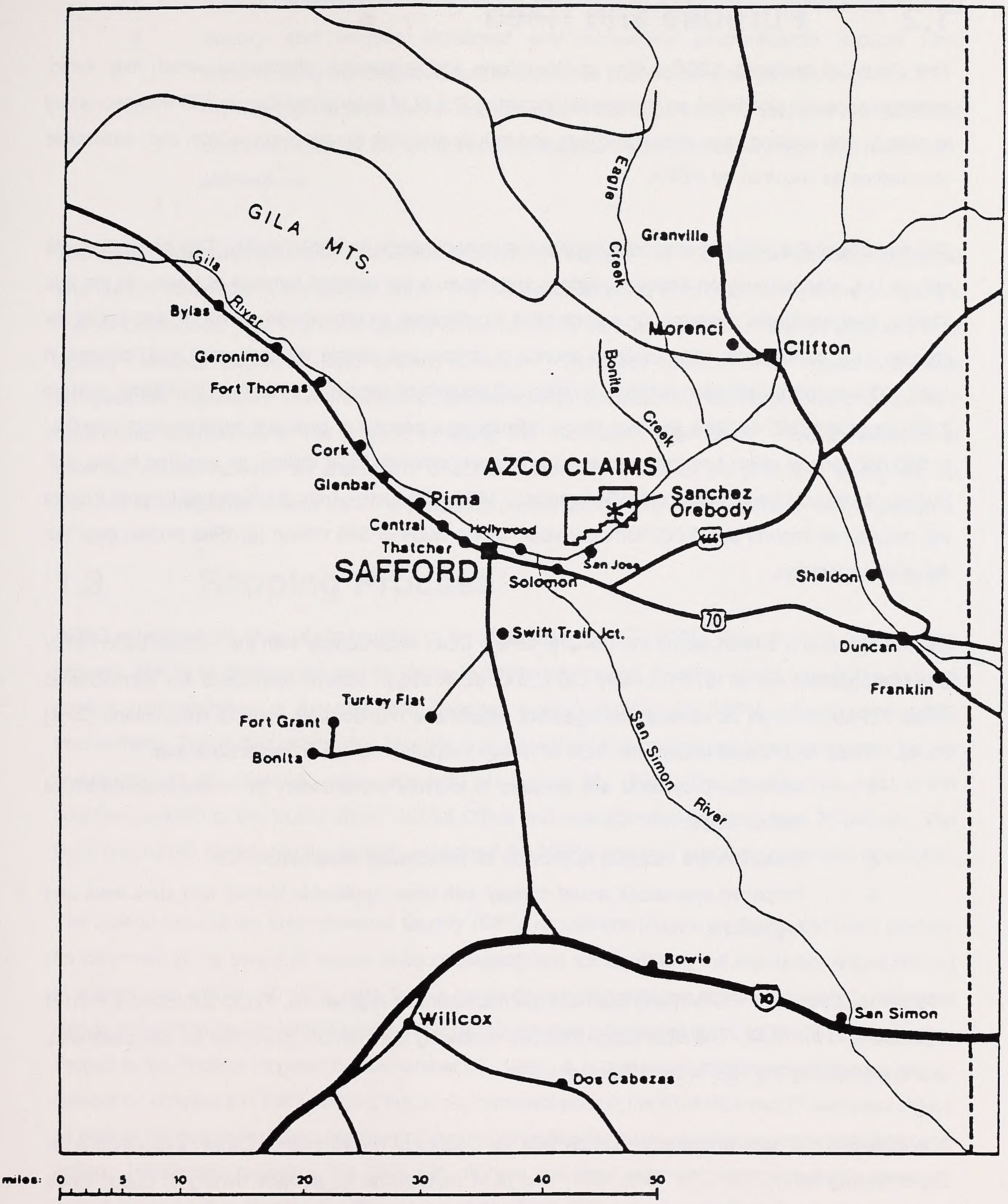


FIGURE 1-2 PROJECT LOCATION MAP, SAFFORD, ARIZONA

1.2 Purpose and Need

This Final EIS analyzes AZCO's Plan of Operations and reasonable alternatives which may avoid, minimize or rectify significant environmental impacts. The BLM determined that an EIS was necessary to comply with existing laws and regulations and to fully evaluate the proposed action and reasonable alternatives as required by NEPA.

The purpose of the action is to extract copper ore from deposits on public lands. This production will reduce U.S. dependency on imported copper and improve the national balance-of-trade. In the mid 1980's, new electronic systems for automobiles significantly increased the demand (and price) for copper. U.S. cars built in 1981 used 30 pounds of copper per vehicle, as compared to 51 pounds in 1991. The average American home now uses 422 pounds of copper in wiring and plumbing, up from 230 pounds in 1980. In 1989, the "net import reliance as a percent of apparent consumption" was 9%, or 203,000 tons of refined copper with a value of approximately $526 million, as reported in the U.S. Bureau of Mines Material Commodity Summaries - 1990. Production from the Sanchez Copper Project will reduce net imports by 25,000 tons per year, with a value of $65 million (at 1989 prices) over the life of the operation.

Mineral operations authorized by the General Mining Laws must comply with the Federal Land Policy and Management Act of 1976 (FLPMA) (30 U.S.C. 22 et seq.). Mineral operations are administered under FLPMA through its surface management regulations (43 Code of Federal Regulations [CFR] 3809). These regulations require the BLM to review proposed operations to ensure that:

1. Adequate provisions are included to prevent unnecessary or undue degradation of federal lands;
2. Measures are included to provide for reasonable reclamation; and
3. Proposed operations would comply with other applicable federal and state laws and regulations.

In order to comply with FLPMA and BLM surface management regulations, AZCO submitted a Plan of Operations to the BLM. The BLM action included reviewing the Plan of Operations for completeness, and implementing the NEPA compliance process.

The Final EIS has been prepared to comply with the Council of Environmental Quality's regulations for implementing NEPA (40 CFR 1500-1508) and BLM regulations for surface mining of public lands (43 CFR 3809), using BLM guidelines for implementing NEPA (Arizona Environmental Handbook H-1790-1). The purposes of the Environmental Impact Statement are to:

1. Assess the environmental impacts of the proposed action and reasonable alternatives;
2. Identify and analyze significant and cumulative environmental impacts from implementing the proposed action and other reasonable alternatives; and
3. Provide the decision maker and the public the opportunity to respond and comment on the analysis of the environmental impacts of the proposed action and reasonable alternatives.

The Final Environmental Impact Statement includes a description of the affected physical, biological and human resources in the project area. The data was obtained from field surveys; the company's Plan of Operations; BLM and other agency files; interviews with BLM and other federal, state and local agency resource personnel; and existing literature. The Final Environmental Impact Statement analyzes the significant environmental consequences of development of the proposed action and reasonable alternatives to the project, including the "No Action Alternative." The assessment of potential effects includes an analysis of direct and indirect impacts of the proposed action and an analysis of cumulative effects from the proposed project added to current actions in the project area.

1.3 Scoping Process

AZCO submitted the Plan of Operations to the BLM on August 2, 1991. Prior to the formal scoping process, the BLM determined that an informal public information meeting would benefit the general public's understanding of the proposed Sanchez Copper Project, the NEPA process, and public involvement. The Public Information Meeting was advertised in local and regional newspapers for two weeks prior to the meeting, which was held on August 28, 1991. The meeting was held in the conference room of the BLM Safford District Office and was attended by more than 75 people. The BLM and AZCO introduced the project, explained the NEPA process, and then answered questions.

The federal Council on Environmental Quality (CEQ) regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). To begin the scoping process, the lead agency publishes a Notice of Intent in the Federal Register. The BLM published a Notice of Intent for the Sanchez Copper Project in the Federal Register on September 27, 1991. A formal public scoping meeting was held in Safford on October 21, 1991. During the public comment period, the BLM received 37 comment letters as well as the oral comments from eleven persons attending the public meeting regarding the proposed action. Information regarding the Draft EIS process and input received during the public comment period is provided in Section 5. The scope of this Final EIS reflects input from the public comment

process. The Draft EIS was published in March 1992, and 39 comment letters were received. These letters have been made part of this evaluation and are presented in Section 5.5.

1.4 Authorizing Agencies

In addition to the Environmental Impact Statement, implementation of the proposed action or the alternatives would require permit approvals from the BLM and other federal, state and local agencies with jurisdiction over the project. Authorizing agencies will issue environmental permits, licenses or approvals required for project construction and/or operation. Table 1-1 summarizes the principal authorizing agencies and the corresponding approval document required for the proposed Sanchez Copper Project. BLM approval of the AZCO mining plan will be conditional on AZCO obtaining all required permits and approvals from these other authorizing agencies.

Table 1-1
AUTHORIZING AGENCIES

AUTHORIZING AGENCY	REGULATORY DOCUMENT/APPROVAL
Bureau of Land Management (BLM)	♦ Plan of Operations ♦ National Environmental Policy Act Compliance ♦ National Historic Preservation Act Compliance ♦ American Indian Religious Freedom Act Compliance ♦ Endangered Species Act Compliance
U.S. Environmental Protection Agency	♦ Storm Water Discharge Permit
U.S. Army Corps of Engineers	♦ 404 (Dredge and Fill) Permit
Arizona Department of Environmental Quality	♦ Aquifer Protection Permit ♦ Air Quality Permits to Install and Operate
Arizona Department of Water Resources	♦ Dam Safety Permit ♦ Well Permits
Arizona Department of Agriculture	♦ Native Plant Law Compliance
Graham County	♦ Lighting Ordinance Compliance ♦ Septic Permit

2.0 Proposed Action and Alternatives

The proposed action and reasonable alternatives, including the "No Action Alternative", are described in the following sections. Alternatives eliminated from consideration are also briefly described, along with reasons for their elimination.

2.1 Proposed Action

The Sanchez Copper Project is located at the southeast end of the Gila Mountains, about ten miles east-northeast of the city of Safford, in Graham County, Arizona. It is being developed by AZCO Mining Inc. (AZCO) on 581 unpatented lode and millsite claims, located on federal lands administered by the BLM.

The project is being developed to mine and process copper ore from the Sanchez orebody, which has been explored by a number of mining companies. These companies drilled an aggregate of 190,000 feet of diamond and rotary drill holes, and developed about 3,000 feet of underground workings.

AZCO acquired the property in 1988, and has been conducting studies and tests to confirm the viability of the project with current technology and economic conditions. AZCO plans to start construction as soon as the required permits have been obtained, and to begin production about one year thereafter.

The Sanchez orebody will be mined using conventional open pit mining techniques and mining equipment. The planned ore mining rate is 12 million tons per year. Waste rock and alluvium will be mined at an average rate over the life of the mine of about 13 million tons per year.

The ultimate pit measures approximately 4,000 feet in diameter with the bottom of the pit approximately 1,200 feet below the south pit rim. It contains 191 million tons of ore and 200 million tons of waste rock. The mining schedule, as shown on Table 2-1, provides a 17-year mine life. Concurrent reclamation will be performed during the life of the mine. Final reclamation will begin during year 17, the decommissioning phase. Revegetation test plots will be developed during the first three years of operations.

Ore from the pit will be transported to the crushing and screening plant prior to being conveyed to the leach pads. Conveyors will be uncovered. The nominal capacity of this plant is 13 million tons per year.

Table 2-1
ANNUAL PRODUCTION BY YEAR

YEAR	ORE	WASTE	TOTAL
0	0.00	2.30	2.30
1	6.00	8.05	14.05
2	12.00	7.93	19.93
3	12.00	8.96	20.96
4	12.00	16.93	28.93
5	12.00	15.87	27.87
6	12.00	17.54	29.54
7	12.00	19.57	31.57
8	12.00	16.91	28.91
9	12.00	20.68	32.68
10	12.00	20.77	32.77
11	12.00	19.10	31.10
12	12.00	17.98	29.98
13	12.00	4.22	16.22
14	12.00	1.15	13.15
15	12.00	.53	12.53
16	12.00	.59	12.59
17	5.00	1.56	6.56
	191.00	200.64	391.64

NOTES: All figures in millions of tons.
Year 0 is pre-production year.

SOURCE: Mining & Environmental Consultants, Inc., 1992

The leach pad will be located on a natural terrace adjacent to the Gila Mountains. One pad, with a capacity of 191 million tons, is planned. Crushed ore will be treated with a strong sulfuric acid solution and allowed to rest in the heap. The ore will then be rinsed using a weakly-acidic raffinate (barren solution) recirculated from the processing facility, producing pregnant leach solution which will be piped back to the processing facility.

High-quality copper cathodes will be produced in the solvent extraction-electrowinning (SX-EW) plant. In the SX section, copper is extracted from the pregnant leach solution and concentrated in the electrolyte fed to the EW tankhouse. In the tankhouse, copper is electrolytically plated onto stainless steel plates to produce the cathode product.

2.1.1 Preferred Access Routes

The project site lies on the north side of the Gila River, while Safford and the major highways lie on the south side. To reach the project site, it is necessary to use one of two bridges across the Gila River -- the 8th Avenue bridge in Safford or the Solomon bridge north of Solomon. The 8th Avenue bridge is designed to handle legal highway loads, while the Solomon bridge is restricted to light vehicles.

There will be two access routes to the project site (Figure 2-1) -- one route for processing plant traffic and one route for general mine traffic. The route to the plant from Safford is north about 1½ miles across the 8th Avenue bridge to Airport Road, then east along Airport Road approximately 4 miles to Solomon Pass Road. The route then proceeds northeasterly along Solomon Pass Road approximately 3½ miles to the plant turn-off, then easterly along a new road for approximately 1½ miles to the plant site, where it connects to the internal project road system. The route from Safford to Solomon Pass Road is paved and maintained by the county and/or city. Solomon Pass Road is a county-maintained dirt road. The new plant road will be gravel-surfaced and will be maintained by AZCO.

The route to the mine from Safford is east along U.S. Highway 70 approximately 5 miles to Solomon, then north across the Solomon bridge and east along Sanchez Road approximately 7 miles to the mine turn-off. The route then runs north about ½ mile along an upgraded, existing dirt road to the mine office. The routes are paved to about ½ mile from the mine turn-off and are state and/or county maintained. The county is in the process of realigning the unpaved portion of Sanchez Road to pass through the project property, and will pave this portion after realignment. The road from Sanchez Road to the mine office will be gravel-surfaced and maintained by AZCO.

Airport Road connects with Sanchez Road approximately 1½ miles beyond the Solomon Pass Road turn-off. This provides an alternate route from Safford to the mine site across the 8th Avenue bridge.

Plant traffic will use the Solomon Pass route to the plant. Mine traffic will use either the primary route across Solomon bridge or the alternate route across the 8th Avenue bridge. Heavy trucks will be required to use the 8th Avenue bridge, and will then proceed along the appropriate route to the plant or mine. Heavy trucks destined for the mine may be routed through the plant to the mine over internal roads, as appropriate.

The increase in traffic resulting from the project is indicated in Table 2-2, Projected Traffic. Calculation of employee traffic utilizes the ¾ factor, since only 3 out of 4 employee "shifts" will work during a 24-

hour period. An average of two persons per car has been assumed. Car pools may reduce the number of employee vehicle trips.

Table 2-2
PROJECTED TRAFFIC

		VEHICLES PER DAY		
SUPPLIES	TRUCK TYPE	Solomon Pass Rd	Sanchez Rd	Total
Sulfuric acid	Acid tanker	20	0	
Repair parts/assemblies	Lo-boy & misc	0	2	
Hardware	Tractor-trailer	0	2	
Diesel fuel	Petroleum	0	1	
Explosives	Tractor-trailer	0	1	
Misc. (gasoline, gasses, oils, greases, solvents, kerosene, used oils and solvents)	Miscellaneous	1	1	
		21	7	28
PERSONNEL				
Workers [210 x ¾ = 158] @ 2/vehicle (ave)		15	64	
Vendors		1	4	
Visitors		2	3	
		18	71	89
PRODUCT				
Cathode	Tractor-trailer or flat bed	2	0	
		2	0	2
	Grand Total	**41**	**78**	**119**

Source: Mining & Environmental Consultants, Inc., 1992

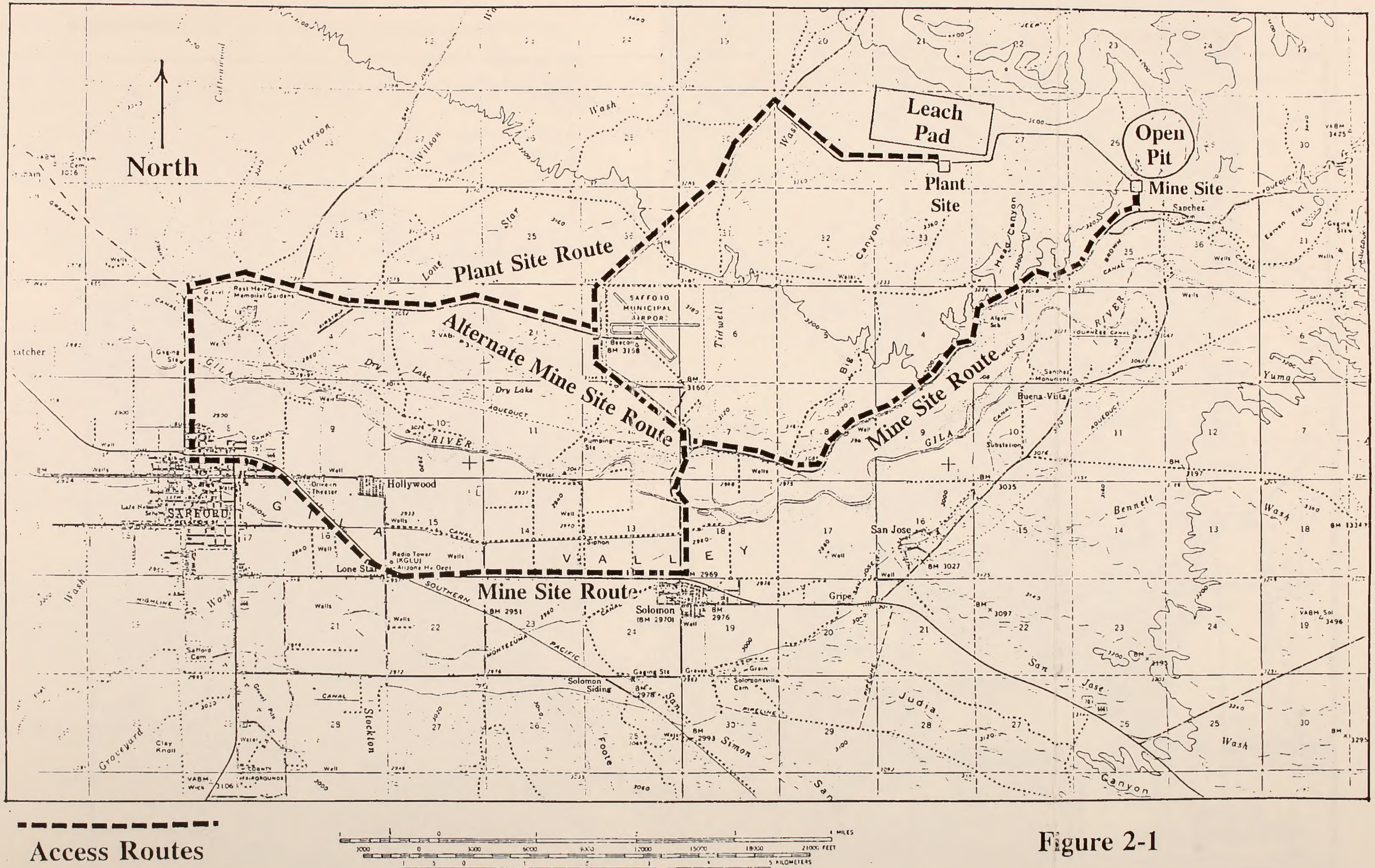
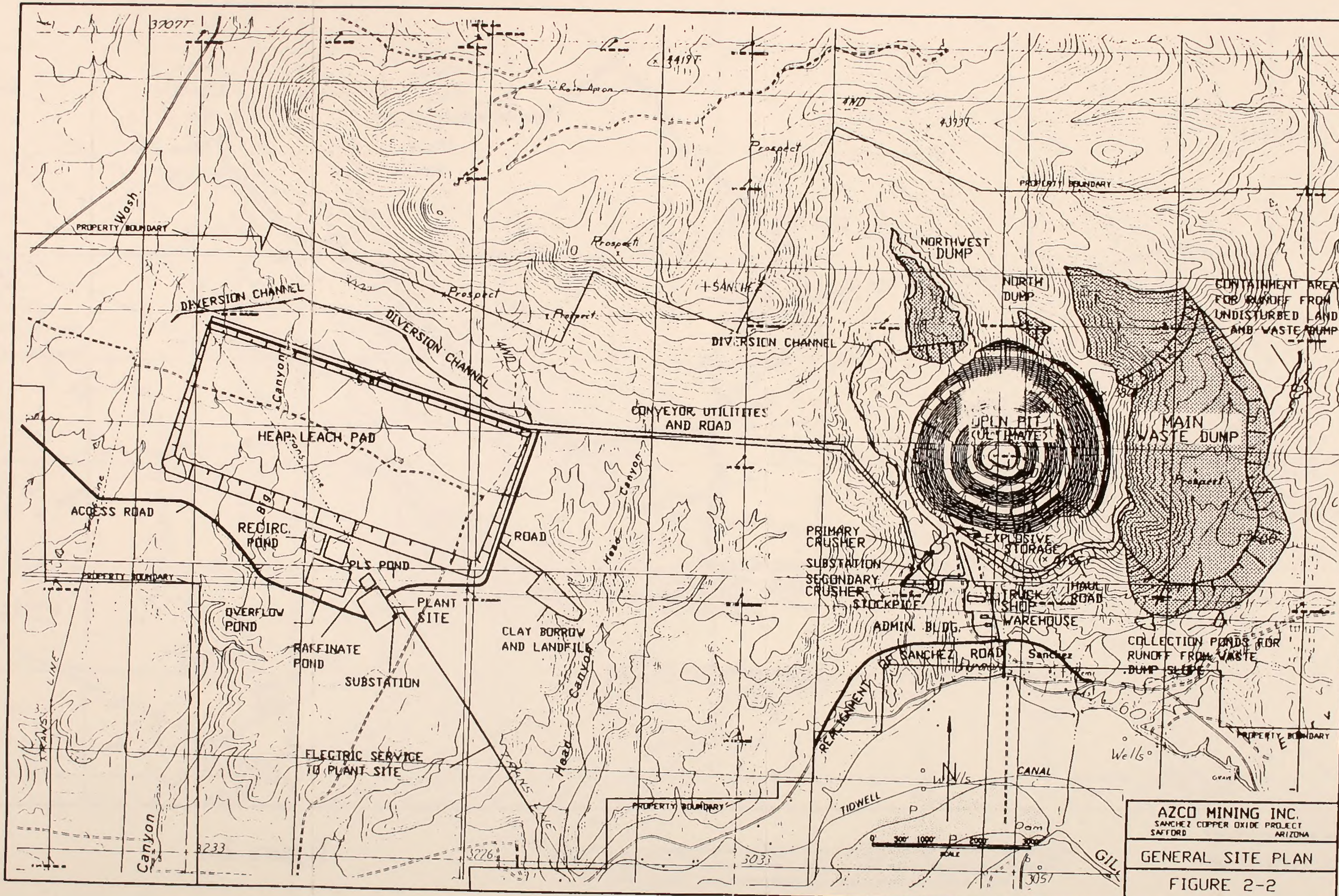


Figure 2-1

ACCESS ROUTES


PROPERTY BOUNDARY
Wash
DIVERSION CHANNEL
DIVERSION CHANNEL
DIVERSION CHANNEL
Prospect
NORTHWEST DUMP
NORTH DUMP
CONTAINMENT AREA FOR RUNOFF FROM UNDISTURBED LAND AND WASTE DUMP
CONVEYOR, UTILITIES AND ROAD
HEAP LEACH PAD
OPEN PIT (ULTIMATE)
MAIN WASTE DUMP
ACCESS ROAD
RECIRC. POND
PLS POND
ROAD
PRIMARY CRUSHER
EXPLOSIVE STORAGE
SUBSTATION
SECONDARY CRUSHER
STOCKPILE
TRUCK SHOP
HAUL ROAD
WAREHOUSE
ADMIN. BLDG.
OVERFLOW POND
PLANT SITE
CLAY BORROW AND LANDFILL
RAFFINATE POND
SUBSTATION
SANCHEZ ROAD
REALIGNMENT OF
COLLECTION PONDS FOR RUNOFF FROM WASTE DUMP SLOPE
ELECTRIC SERVICE TO PLANT SITE
Canyon
Head Canyon
CANAL
TIDWELL
Wells
N
AZCO MINING INC.
SANCHEZ COPPER OXIDE PROJECT
SAFFORD ARIZONA
GENERAL SITE PLAN
FIGURE 2-2

2.1.2 Exploration History and Existing Surface Disturbance

The Sanchez orebody has been explored and developed on a limited basis by a number of mining companies. Beginning in the 1950's and continuing until the late 1980's, the property was evaluated by Kennecott Copper Corporation, Rancher's Exploration, United Nuclear Corporation, Union Pacific Mining Company, The Anaconda Copper Company, Inspiration Consolidated Copper Company, and AZCO Mining Inc. These companies drilled an aggregate of 190,000 feet of diamond and rotary drill holes, and developed about 3,000 feet of underground workings.

The property was not developed into a mine for a variety of reasons, but primarily because the economics of mining a low-grade oxide copper orebody with the technology then available were not attractive.

AZCO acquired the property in 1988, and has been conducting studies and tests to confirm the viability of the project with today's technology and economic conditions. AZCO plans to commence construction as soon as the required permits have been obtained, and to begin production approximately one year thereafter. A target date for production has been scheduled for early 1994.

A feasibility study was completed in May 1989, by Fluor Daniel, Inc. of Redwood City, California, working with Wright Engineers of Vancouver, British Columbia [Fluor Daniel, Inc., 1989]. A revision, incorporating new data, was completed in November 1990, by Wright Engineers [Wright Engineers Ltd., 1990].

Exploration roads and drill pads, plus previous mining, leaching, and stockpiling operations to test the orebody have affected approximately 208 acres. Existing public access roads through the area affect 24 acres, and the new county road will affect approximately 13 acres when completed. Total existing surface disturbance (including the new county road) at the project site is 245 acres.

2.1.3 Proposed Surface Disturbance

AZCO has revised the General Site Plan (Figure 2-2) presented in the Draft EIS. Principal revisions are:

1. The initial heap leach pad with its associated ponds has been eliminated. The site of the "future heap leach pad" is now the only leach pad location.
2. The plant site has been moved to a new position south of the leach pad.
3. The design of the ponds below the leach pad has been fully developed.
4. A new access road has been added from Solomon Pass Road to the new plant site.

5. A borrow pit for clay to line the leach pad has been shown.
6. The conveyor alignment has been revised due to removal of the Initial Heap Leach Pad.
7. Minor revisions have been made to the crushing plant, mine shop, offices, and waste dump.

The proposed surface disturbance is shown in Table 2-3. Disturbed areas have been recalculated based on new 1"=200' scale maps.

Table 2-3
AREAS OF DISTURBANCE

	Number of Acres
Open Pit	277
Main Waste Dump and Haul Road	450
Northwest Waste Dump	33
North Waste Dump	4
Leach Pad	484
Crushing Plant	11
SX-EW Plant	9
Ponds	20
Conveyor, Road and Utilities Corridor	36
Shop, Office, Parking	15
Roads	30
Clay Borrow Pit	11
Miscellaneous	20
	1,400

Note: Disturbed areas have been increased by 10% from calculated values to allow for disturbance along boundaries.
Source: Mining & Environmental Consultants, Inc., 1992

2.1.4 Development Drilling

Prior to mining the open pit, AZCO may conduct some additional development drilling in the pit area.

2.1.5 Mining Operations

The Sanchez orebody will be mined using conventional open-pit mining techniques and mining equipment. The mine will operate 7 days per week with 2 or 3 shifts, depending upon the amount of material to be moved, which may vary from year to year.

2.1.5.1 Open Pit

The pit will have bench slopes of 42 degrees in the alluvium, and 47 degrees to 57 degrees in the porphyry and basalt. Bench heights will be 40 feet during mining, and two benches will be combined after ore removal, resulting in a final bench height of 80 feet. A 100-foot-wide safety bench will be left on the north side of the pit at the 3,300 foot elevation to trap potential falling rocks from the steep, unmined higher elevations of the hill.

The ultimate pit will measure approximately 4,000 feet in diameter. Measured from the south rim, the pit will be approximately 1,200 feet deep, reaching the 2,000 foot elevation mark.

2.1.5.2 Drilling and Blasting Procedures

Drill patterns will be laid out in accordance with a monthly mining plan. Rotary blast-hole drills will drill 8-inch to 12-inch holes to a typical depth of 40 feet to 45 feet. Drill cuttings will be sampled for copper content prior to loading the holes with explosives. One drill will be needed initially, with a second drill to be added as the pit expands.

Blast holes will be loaded with an ammonium nitrate-based blasting agent, plus a high-explosive primer. Blasting will typically occur once a day, or every other day, during daylight hours, as dictated by operating schedules. Typically, 30 to 60 holes will be initiated in each blast. Blasting must be of sufficient strength to break the rock, and this will cause unavoidable vibration and dust.

All explosives required for blasting would be stored in a barricaded magazine. The storage area will be designed to meet the standards of the Mine Safety and Health Administration (MSHA).

2.1.5.3 Waste Rock Disposal

During the construction phase, about 2 million tons of soil and waste rock will be removed. The soil will be stockpiled for later reclamation, and the waste rock will be used to construct roads, yards, building pads, dams and embankments. Waste-rock mining will vary from a low of less than one million tons per year to a high of about 21 million tons per year.

Approximately 200 million tons of waste rock will be disposed of during the life of the mine. The primary waste rock dump site is located on the hillside and flat immediately east of the pit, as shown in Figure 2-2. Two smaller waste rock sites are located just northwest of the pit, also as shown in Figure 2-2. These sites will be used for disposal of waste rock generated during stripping of the upper pit benches.

Waste rock will be hauled to the disposal area by 150-ton trucks and end-dumped over the crest of the dump. An overland conveyor/mobile stacker system may be used to transport and place waste rock on the dump at some future stage of mine development. A dozer will be used on the dump to maintain grade and to build a safety berm along the crest.

The main waste dump will be developed from the south toward the north, commencing with an initial "finger dump" running eastward across the flat at the southern disposal area boundary. After development of this initial area, all dumping will be toward the north, away from the county road.

The top of the waste rock will be sloped gently toward a ditch along the ridge forming the western boundary of the disposal area. Runoff from the top of the waste rock and the ridge would be channeled to a pond at the north end of the dump. [M&EC, 1990]

Soil, where available, will be salvaged and stockpiled for dump reclamation.

2.1.5.4 Ore Mining

Annual ore production will be approximately 12,000,000 tons per year. The mine reserves are calculated at 191,000,000 tons of ore. The ore will be transported from the pit by truck and dumped into the primary crusher located on the western pit rim. The ore will be hauled from the pit by 150-ton end-dump trucks.

2.1.5.5 Materials Handling

After the ore is mined, it will be hauled to the crushing plant where it will be reduced to minus 1½ inch size by primary and secondary crushing. The crushing plant and conveying system will operate three 8-hour shifts, 365 days per year.

2.1.5.6 Pit Dewatering

There are two aquifers in the area of the open pit, the Upper Gila Conglomerate aquifer and the Bedrock aquifer. The Upper Gila Conglomerate aquifer receives recharge from the Upper Gila

Conglomerate watershed and from the Bedrock aquifer.

The open pit will intercept a maximum thickness of approximately 80 feet of saturated, cemented conglomerate in the Upper Gila Conglomerate aquifer at the southern-most edge of the pit. It will also intercept approximately 1,000 feet of fractured andesite and quartz monzonite porphyry, which makes up the Bedrock aquifer.

Inflows to the pit from the two aquifers have been calculated at up to 170 gpm from the Upper Gila Conglomerate aquifer and up to 250 gpm from the Bedrock aquifer. Since its main source of recharge will be cut off by the excavation of the pit, the Upper Gila Conglomerate is expected to be locally dewatered in the pit area after a few years. Inflow from the Bedrock aquifer should continue throughout and after the life of the mine.

The anticipated inflow is much less than the 1,600 gpm anticipated project usage. All water captured in the pit or by dewatering wells just south of the pit will be used in the operation of the project.

If the pit fills with excess groundwater, the excess water would be pumped to a storage reservoir in the northeast quarter of Section 35. The bottom of the reservoir would not be compacted, and the water would slowly infiltrate into the existing groundwater system. This method would recharge the upper aquifer, and the water would eventually migrate toward the irrigation wells. This disposal method assumes that the quality of water would be similar to the quality of water existing in the upper aquifer. A permit may be required from Arizona Department of Water Resources to construct the reservoir dam. Arizona DEQ would evaluate the quality and quantity of groundwater and, based on the results of its evaluation, could require a permit.

2.1.5.7 Haul Roads

The main haul road in the pit will be extended down as the depth of the pit increases. The haul road will be 100 feet wide and will have a grade of 8%. From the top of the pit, the waste dump haul road will be constructed through the ridge to the south of the pit. This haul road will also be 100 feet wide. As required by the Mine Safety and Health Administration, a berm will be built along the outside edge of the road. The haul road will be constructed from waste material. A road grader will keep the surface smooth, and water or a chemical (lignosite or magnesium chloride) will be added as needed for dust suppression.

2.1.5.8 Major Equipment

Mine equipment required for start-up is shown below. Additional haulage trucks and road maintenance equipment will be required as the pit deepens.

Approximate Number	Description
2	Front-end Loader or Hydraulic Excavator, 21 cu.yd.
1	Rotary Drill, 8" - 12"
7	Haulage Trucks, 120 - 150 ton
2	Water Trucks, 8,000 gallon
1	Crane Truck/Service Truck
1 each	Lube Truck + Fuel Truck + Service Truck
8	Pick-up Trucks
1	Loader, 13 cu.yd.
3	Dozer with ripper
1	Wheeled Dozer
2	Motor Graders
1	Mobile Crane
1	Forklift, Tire Manipulator
1	Ambulance
5	Light Stands
2	Shift Busses

2.1.6 Ore Processing Facilities

Copper will be recovered from the ore by conventional heap leaching. The crushed ore will be cured by a strong acid solution to dissolve the copper, then rinsed with a weak acid solution recirculated from the solvent extraction-electrowinning (SX-EW) plant. The pregnant leach solution flows by lined ditches to lined ponds. From the ponds it is pumped to the SX section, where the copper is extracted and a purified, enriched electrolyte is produced. The barren solution (raffinate) is returned to the leach pad to rinse the ore. Copper is produced in the EW tankhouse from the electrolyte solution.

2.1.6.1 Leach Pad

The heap leach pad has been redesigned by Vector Engineering, Inc. [Vector, 1992]. The two leach pads (the initial and future leach pads) discussed under Proposed Action in the Draft EIS have been consolidated into one leach pad located on the terrace west of Head Canyon. This was one of the leach pad alternatives in the Draft EIS. The process solution ponds have also been consolidated and the ponds and SX-EW plant relocated to the terrace down-gradient from the pad. All process facilities have therefore been consolidated in one location, which eliminates the piping of process fluids across Head Canyon.

The soil in the leach pad area generally consists of calcium carbonate-cemented silty to clayey gravel and cobble alluvium deposits up to several tens of feet in thickness, underlain by silty and sandy clays hundreds of feet thick. Lacustrine clays, silts, and sands are present throughout the site beneath the conglomerate [Sergent, Hauskins & Beckwith, 1990a & b].

Both clay and a high-density polyethylene (HDPE) geomembrane were considered for the pad liner. A source of suitable clay is available in the immediate area of the leach pad. Clay was selected over HDPE for the leach pad for a number of reasons, as discussed in Section 5.5, General Response No. 8 - Clay Liner v. Synthetic Liner.

The clay planned for use has been tested and found to be compatible with the pregnant leach solution [Metcon, 1992 and Vector, 1992]. Because of its carbonate content, the permeability of the clay decreases when contacted by acid due to the formation of gypsum.

A geomembrane forms a barrier a small fraction of an inch thick between the heap and the ground surface. A clay liner is constructed to form a barrier many inches thick, much less subject to puncture from above or below.

HDPE liner sheets must be joined in the field utilizing a relatively high-tech welding process. On a pad of this size, over 70 miles of seams would be required. A clay liner is installed in compacted lifts, and has no seams as such. The clay liner is to be protected from desiccation during construction to prevent shrinking cracks, and will be in compression under the heap, preventing tension cracking.

The liner will consist of three 4-inch lifts of clay compacted to a permeability of 10^{-7} cm/sec. The sub-base of the pad will be compacted prior to lining with clay. The clay for lining will be obtained from a clay borrow pit located adjacent to the pad. The liner system will comply with "best available demonstrated control technology" (BADCT) standards for copper heap leach pads as defined by the Arizona Department of Environmental Quality [ADEQ, 1989].

The leach pad will be built in three phases, as shown in Figure 2-3. Phase 1 will be built east of the power line which crosses the pad site and will cover approximately 25% of the total pad area (about 121 acres). The power line will be relocated prior to the construction of Phase 2. During Phase 2, the pad will be expanded to the northwest to approximately 62% of its final area (about 294 acres). The pad will be expanded to its final area (about 484 acres) during Phase 3. These areas include an allowance for external ditches, berms and a perimeter road.

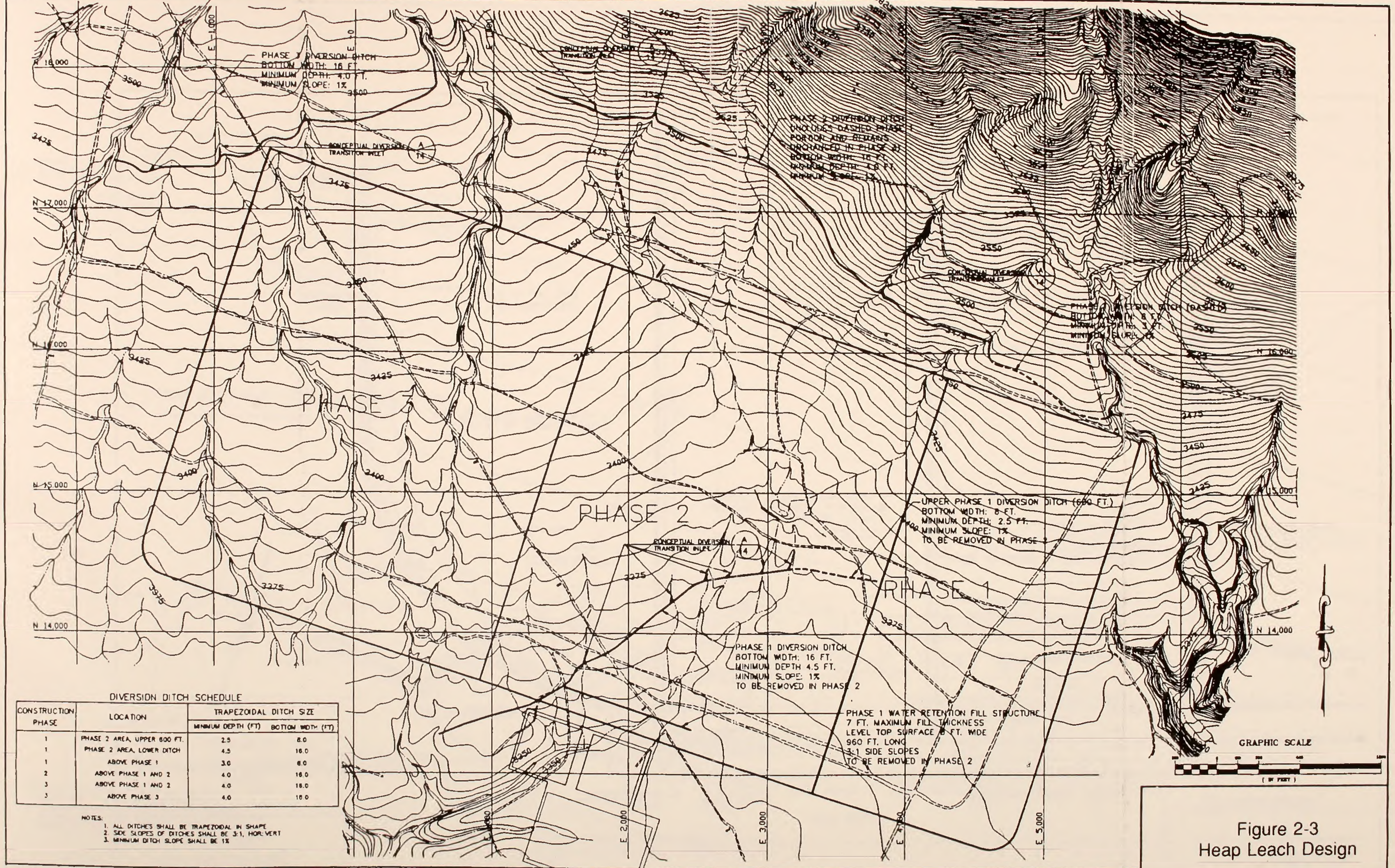
During construction, the area will be cleared and grubbed, and may be treated with a BLM-approved herbicide, if appropriate. The liner will then be installed in compacted layers. Written quality control procedures (Vector, 1992) will be followed by the contractor, and quality assurance procedures will be carried out by AZCO. A series of internal berms will be constructed on the liner to divide the pad into cells. Perforated plastic pipe will be placed on top of the liner to facilitate solution flow and maintain a low hydraulic head on the liner. The liner will be covered with a layer of select crushed ore to provide a drainage layer and to protect the liner from mechanical damage or desiccation.

Pregnant leach solution (PLS) collected by the pipes under the ore heap will be discharged into one of two parallel, lined ditches located external to the heap along the perimeter of the pad. One ditch will convey high-grade solution to the PLS pond, and the other will convey low-grade solution to the recirculation pond. The low-grade solution will be returned to the ore heap to leach additional copper, while the high-grade solution will be pumped to the SX-EW plant. The ditches will have a composite liner of 80 mil HDPE over compacted clay and will incorporate a leak detection/collection system. Leak collection pipes will drain to the PLS pond. Perimeter ditches, internal berms and solution piping are shown on Figures 2-4 and 2-5.

Crushed ore will be transported to the leach pad by overland conveyor. It will then be transferred to a mobile stacking conveyor system and placed directly on the pad. Ore will be placed in 30-foot lifts until the heap has reached its designated height. Set-backs will be used between lifts to maintain an overall 2:1 (horizontal:vertical) slope on the faces of the heap. Dozers may be needed from time to time to level the top of the heap. Haul trucks may be used to spread ore on the leach pad instead of the mobile stacking system during the early stages of leach pad development. Cross-sections through the heap are shown on Figure 2-6.

The ore will be treated using two solutions. First, a curing solution containing 200 grams per liter sulfuric acid will be sprayed onto the ore as it leaves the stacking conveyor. The curing solution wets the ore to approximately 7% moisture. Little of this solution is expected to report to the pregnant solution pond.

The ore will be allowed to cure for at least three days. It will then be rinsed with raffinate (weakly acidic leach solution, approximately 5 grams per liter sulfuric acid) recirculated from the SX plant, or low-grade solution from the recirculation pond. The rinse solution will be pumped from the raffinate or recirculation pond through headers along the leach pad and will be delivered to the surface of the heap through a piping network of laterals, distributor lines and sprinklers. The last two piping components will be laid on top of the heap.



DIVERSION DITCH SCHEDULE

CONSTRUCTION PHASE	LOCATION	TRAPEZOIDAL DITCH SIZE	
		MINIMUM DEPTH (FT)	BOTTOM WIDTH (FT)
1	PHASE 2 AREA, UPPER 600 FT.	2.5	8.0
1	PHASE 2 AREA, LOWER DITCH	4.5	16.0
1	ABOVE PHASE 1	3.0	8.0
2	ABOVE PHASE 1 AND 2	4.0	16.0
3	ABOVE PHASE 1 AND 2	4.0	16.0
3	ABOVE PHASE 3	4.0	16.0

NOTES:
1. ALL DITCHES SHALL BE TRAPEZOIDAL IN SHAPE
2. SIDE SLOPES OF DITCHES SHALL BE 3:1, HOR:VERT
3. MINIMUM DITCH SLOPE SHALL BE 1%

Figure 2-3
Heap Leach Design

VECTOR ENGINEERING, INC.

12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945 (916) 272-2448

Drawing Name	
Location	GRAHAM COUNTY, ARIZONA
Drawing No	2
File Name	M16
Revision	0

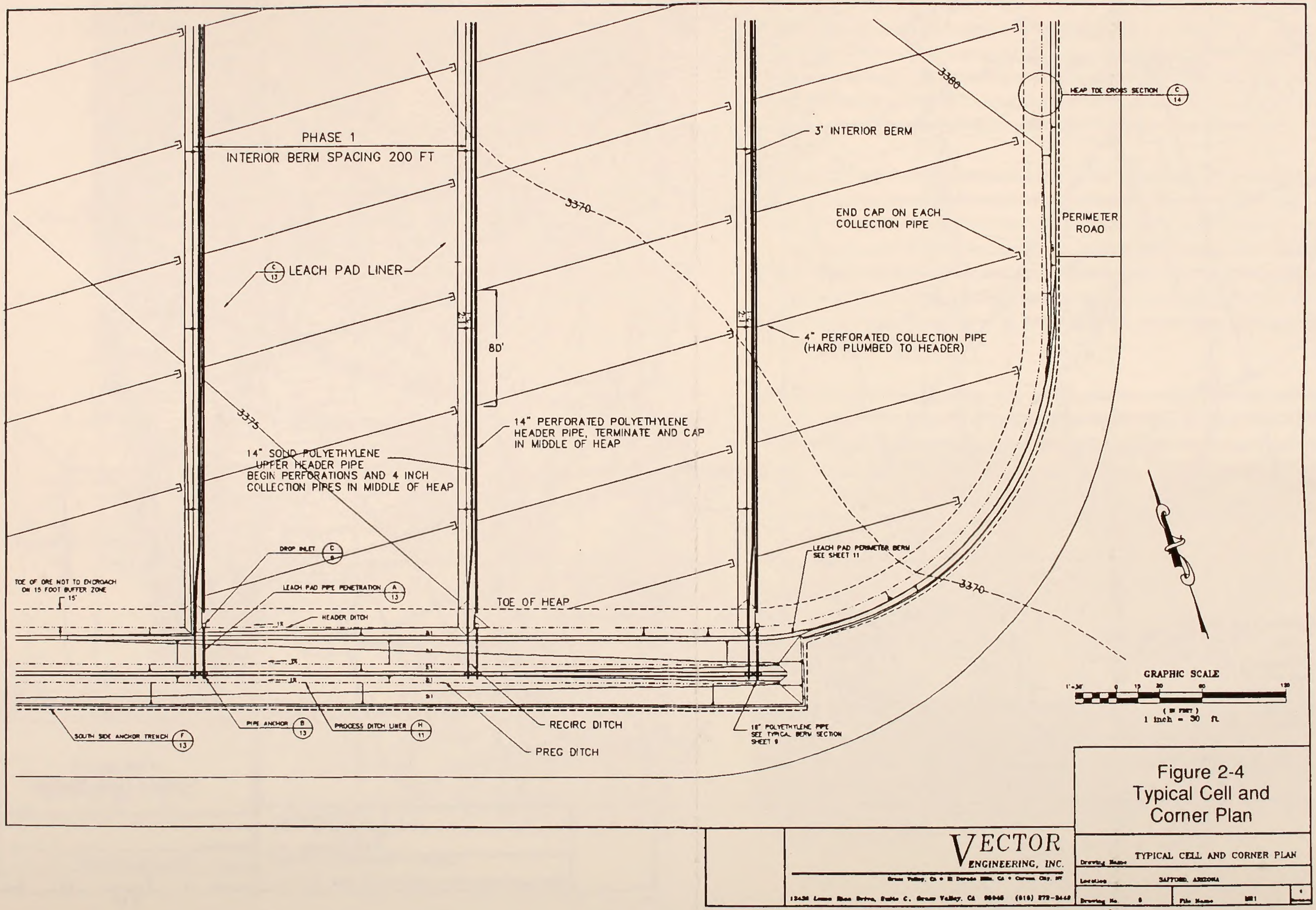


Figure 2-4
Typical Cell and
Corner Plan

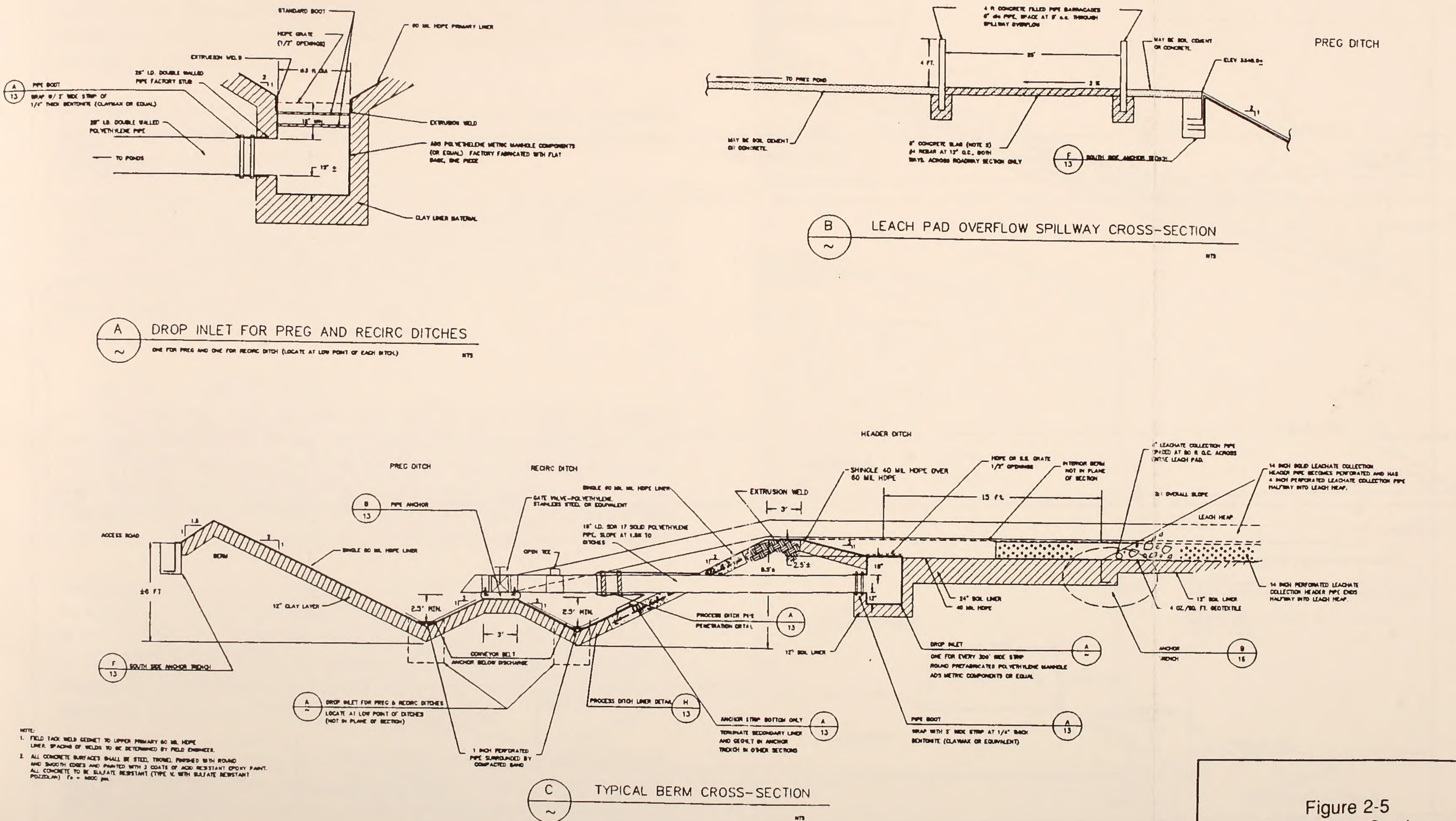


Figure 2-5
Berm Cross-Section

VECTOR ENGINEERING, INC.

12430 Loma Rica Drive, Suite C Grass Valley, CA 95945

Drawing Name: BERM CROSS-SECTION

Location: GRAHAM COUNTY, ARIZONA

Drawing No. 2-17

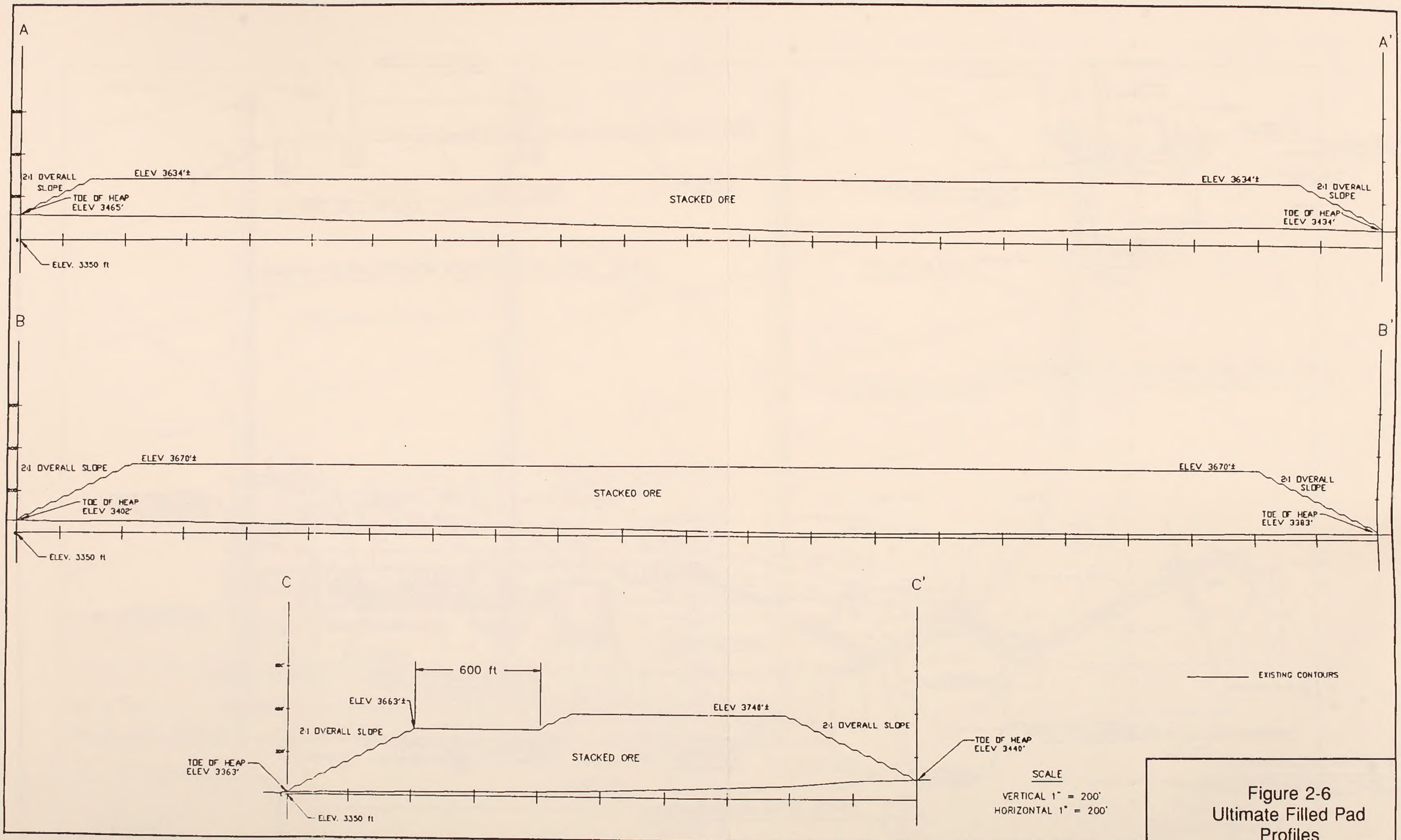


Figure 2-6
Ultimate Filled Pad Profiles

VECTOR ENGINEERING, INC.
Grass Valley, CA • El Dorado Hills, CA • Carson City, NV
12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945 (916) 272-2448

Drawing Name: ULTIMATE FILLED PAD PROFILES
Location: GRAHAM COUNTY, ARIZONA
Drawing No. 7 | File Name M23

Sprinklers will be used to distribute the solution on the heap. The planned application rate is 0.0025 gallons per minute (gpm) per square foot. Allowing for evaporation loss, the total application rate (raffinate and recirculated PLS) will be 8,000 gpm. Fixed pump stations by the raffinate and recirculation ponds will be used to pump the rinse solution.

Sulfuric acid solution for ore curing will be hauled by a tanker truck to the leach pad. The solution will be pumped from the tanker to the ore stacker through a short, dedicated pipeline. Solution will be applied to the ore as it leaves the stacker by sprays.

The piping between the ponds and the leach pad, including the headers, will be installed as permanent systems. The remainder of the solution application piping will be installed as temporary systems and will be relocated as required during heap development. All piping will be designed to withstand the maximum anticipated pressure plus a safety factor. HDPE pipe will be utilized as much as practical, due to its resistance to acid, flexibility and proven durability.

2.1.6.2 Solution Ponds

Pond sizes for the three phases of leach pad construction were determined based on operational requirements, an allowance for drain-down during power or pump outages, and projected maximum runoff. To determine runoff storage requirements, a water balance was prepared covering a three year period. The rainfall during each year was assumed to be equal to the wettest year on record for Safford (1965, with 17.41 inches), which included the wettest month on record (December, 1965, with 6.24 inches). A 100-year, 24-hour storm was assumed to occur in the middle of the second year.

The pregnant leach solution (PLS) and recirculation ponds will be located down-gradient from the leach pad, as shown in Figure 2-7. These ponds will be designed to contain 13.4 million gallons each, and will be connected by a weir to allow utilization of the available capacity in both ponds when required. The two ponds will provide double-lined storage for the normal operating volume of 12.0 million gallons, an additional 11.5 million gallons for 24 hours of pad drain down, plus the maximum cumulative runoff storage (1.8 million gallons for Phase 1), with 1.5 million gallons excess.

Before the pad is enlarged for Phase 2, additional capacity will be provided in an overflow pond constructed down-gradient from the PLS and recirculation ponds. This pond will have a capacity of 39.2 million gallons and will be connected to the recirculation pond by weir. With the overflow pond, lined storage capacity will be increased to 66 million gallons. This is adequate to contain the normal

12.0 million gallon operating volume, 11.5 million gallons of pad drain-down, 16.2 million gallons maximum cumulative runoff storage, with 26.3 million gallons excess.

For phase 3, no new pond capacity is planned. The lined ponds will contain the normal 12.0 million gallon operating volume, 11.5 million gallons of pad drain-down, and 42.5 million gallons maximum cumulative runoff storage. A recapitulation of volumes and pond capacities is presented below:

	Phase 1	Phase 2	Phase 3
POND REQUIREMENTS	.....Millions of Gallons.....		
Normal operating volume in process ponds	12.0	12.0	12.0
Pad drain down (24 hours at 8,000 gpm)	11.5	11.5	11.5
Maximum cumulative storage (wet year + 100-year storm)	1.8	16.2	42.5
Required capacity in lined ponds	25.3	39.7	66.0
POND CAPACITIES			
Process pond capacities	26.8	26.8	26.8
Additional lined capacity provided	.0	39.2	39.2
Total available capacity	26.8	66.0	66.0

A raffinate pond with a capacity of approximately 4.2 million gallons will be constructed down-gradient from the plant. All solution flow from the plant, including spillage and precipitation runoff, will flow by gravity into this pond. Sufficient freeboard will be provided to contain the design storm and the largest plant spill. Any raffinate pond overflow will be carried through a pipe to the PLS pond.

A cross-section through the ponds is shown on Figure 2-8. All process solution ponds (including the overflow pond) will be double-lined with two layers of HDPE geomembrane, a 60-mil layer over a 40-mil layer. A geotextile drainage net will be placed between the upper and lower geomembrane to conduct any leakage from the upper liner to a drainage collection sump between the liners on the bottom of the ponds.

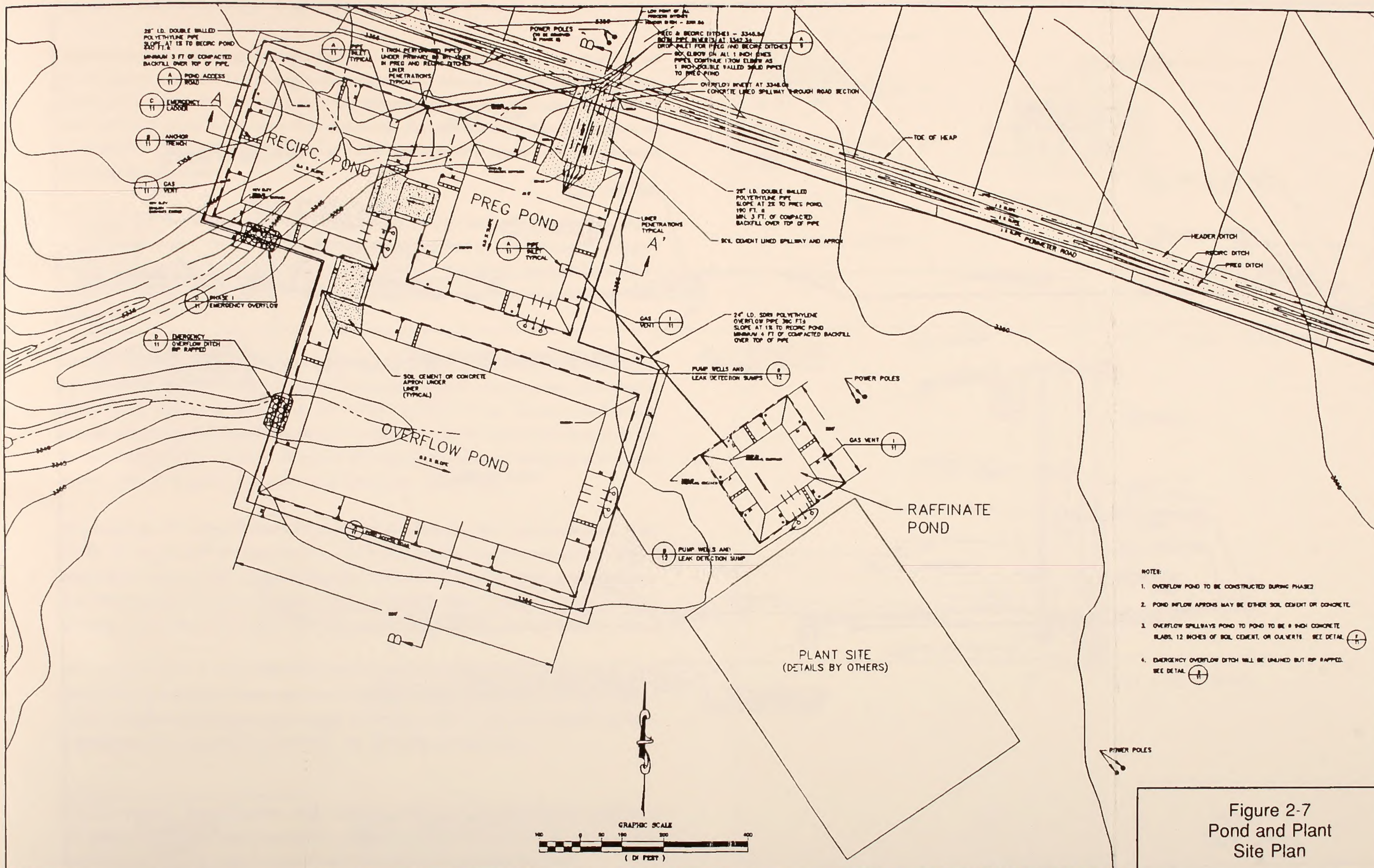


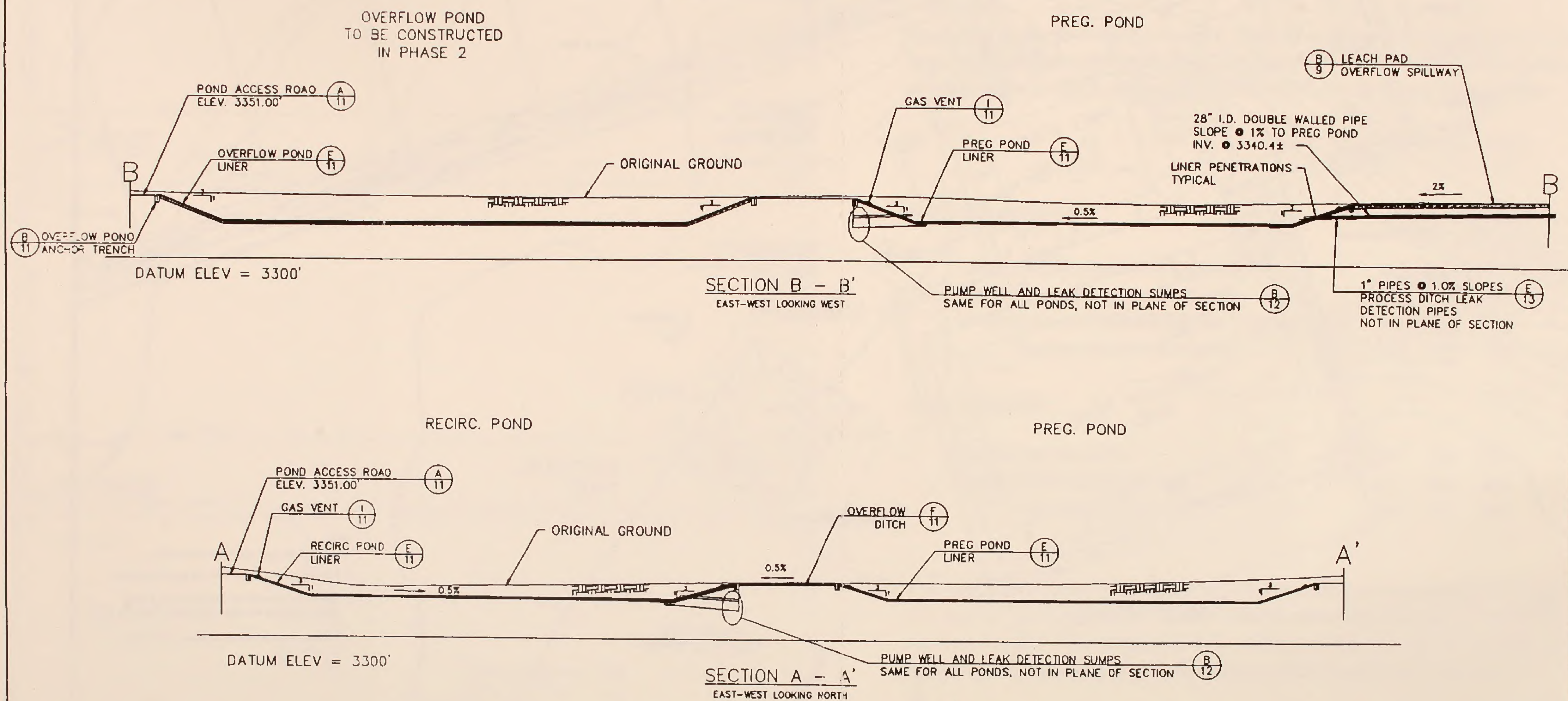
Figure 2-7
Pond and Plant
Site Plan

VECTOR ENGINEERING, INC.

Grass Valley, CA • El Dorado Hills, CA • Carson City, NV

12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945 (916) 272-2448

Drawing Name	POND AND PLANT SITE PLAN
Location	GRAHAM COUNTY, ARIZONA
Drawing No.	6
File Name	M22
Revision	0



SCALE: HORZ: 1"=40'
VERT: 1"=40'

Figure 2-8
Pond
Cross-Sections

VECTOR ENGINEERING, INC.

12438 Loma Rica Drive, Suite C Grass Valley, CA 95945

Drawing Name: POND CROSS SECTIONS

Location: GRAHAM COUNTY ARIZONA

Drawing No: 2-22

Details of the liner system are shown on Figure 2-9. Any leakage reporting to the collection layer will be detected by a scheduled monitoring program approved by Arizona Department of Environmental Quality (DEQ) and the BLM. The monitoring program is described in Appendix D and will be approved by Arizona DEQ as part of the Aquifer Protection Permit. BLM approval of the Plan of Operations will be conditional upon AZCO obtaining all other federal, state and local permits required to construct and/or operate the project.

The pond embankments will be earth-fill structures constructed with material excavated from the interior of the solution ponds. The HDPE liner will be installed on a graded and well-compacted foundation consisting of a layer of material with 100% finer than 3/4 inch. Dam design and construction will be subject to review and monitoring by the Safety of Dams Division of the Arizona Department of Water Resources.

The drainage area above the leach pads is relatively small. However, the topography of the mountain behind the pads is steep, causing a large portion of the precipitation to result in runoff. Ditches will be constructed upstream of the leach pads to divert runoff away from the pad. As shown on Figure 2-2, these ditches will be routed around the sides of the leach pads and will drain to the natural gullies on the east and west sides. Similarly, ditches will be constructed upstream of solution ponds to allow runoff from the uphill area to pass safely around the ponds. [Vector, 1992]

Pipelines between the ponds and the plant, and the plant and the pad, will be constructed using HDPE or other acid resistant pipe (as appropriate). Lines will not be buried except as necessary to prevent excessive line movement due to thermal expansion. Ditches will be utilized to direct spills from broken lines into the pregnant solution or raffinate ponds. Line integrity will be tested using compressed air and water before placing the line in service. Lines will be inspected daily to detect damage or leaks.

Plans call for fencing the ponds and solution ditches to exclude cattle and other large animals. The chemical constituents of the ponds create a copper sulfate solution. As opposed to cyanide, copper sulfate has not been observed to cause waterfowl mortalities. In the event of mortalities of regulated migratory birds, the ponds will be covered with nets to provide a positive barrier.

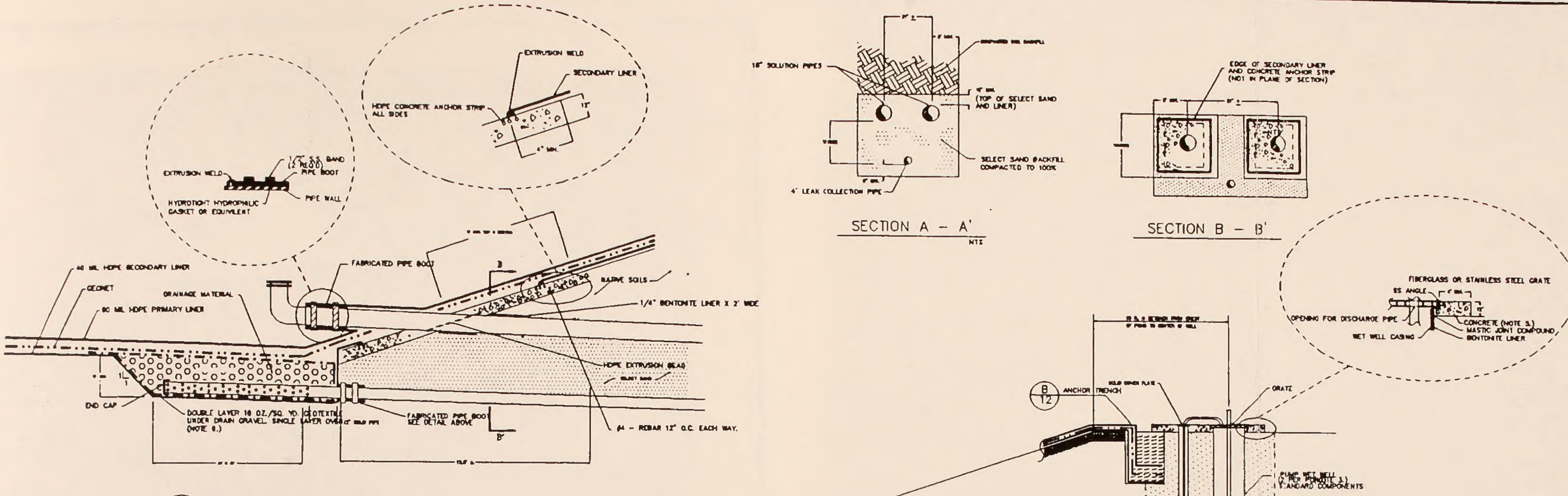
Projected chemical characterization of the process ponds has been developed by Mining & Environmental Consultants, Inc., expressed as milligrams per liter. Recirculation and raffinate pond constituents are the same as the pregnant leach solution (PLS) pond except as noted:

Constituent	PLS	Recirculation	Raffinate
Arsenic	< 0.05		
Aluminum	5,000.		
Barium	<0.01		
Cadmium	<0.005		
Chloride	300.		
Chromium (total)	< 0.01		
Copper	3,600.	2,200.	200.
Fluoride	0.5		
Hardness	5.		
Iron	3,000.		
Lead	< 0.05		
Magnesium	770.		
Manganese	100.		
Mercury	< 0.0003		
Nickel	< 0.04		
Nitrate (as N)	0.1		
pH	1.8	1.6	1.5
Phenol	< 0.001		
Potassium	3.0		
Selenium	< 0.1		
Silver	< 0.01		
Sodium	100.		
Sulfate	19,000.	19,000.	19,000.
Total Dissolved Solids	32,000.	32,000.	29,000.
Zinc	<0.01		

2.1.6.3 Processing Facilities

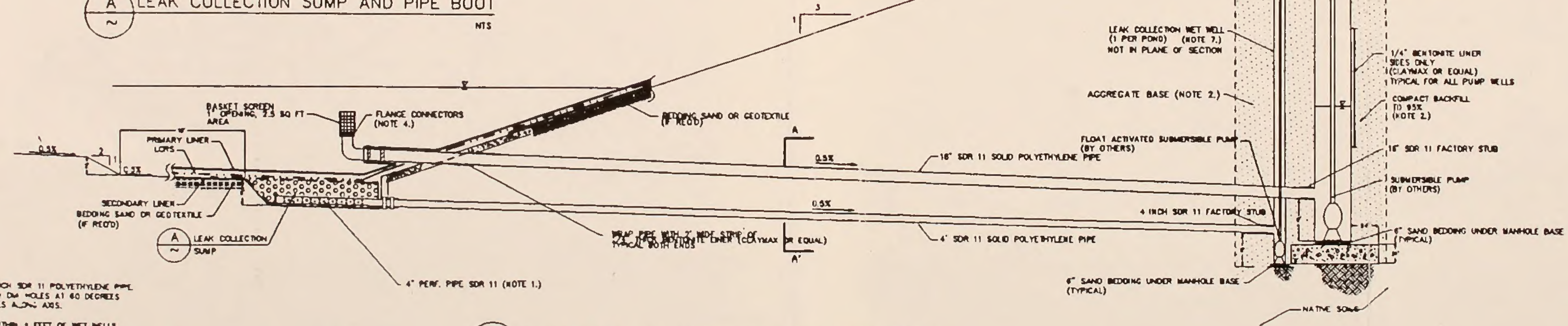
Prior to construction of the plant and installation of the pond liners, the processing facilities area will be graded and sloped in order to channel potential spills into controlled containment sumps.

After the processing facilities have been built and tested, the copper recovery process (Figure 2-10) will commence. The pregnant solution is pumped from the pregnant solution pond to the solvent extraction plant by two pumps. One operating pump can deliver up to the maximum design flow rate of 4,000 gpm, giving 100% back-up pumping capacity.



A LEAK COLLECTION SUMP AND PIPE BOOT

NTS



B PUMP WELL AND LEAK DETECTION SUMP DETAIL

2 PUMP WELLS AND 1 LEAK DETECTION SUMP FOR PREG, REORC, AND RAFFINATE PONDS

NOTES:

1. FIELD PERFORATED 4 INCH SDR 11 POLYETHYLENE PIPE. PERFORATE 6-1/4 INCH DIA HOLES AT 60 DEGREES SPACED EVERY 6 INCHES ALONG AXIS.
2. USE 3/4" ABC BASE WITHIN 4 FEET OF WET WELLS
3. ADS POLYETHYLENE MANHOLE (OR EQUAL) FACTORY FABRICATED WITH WELDED JOINTS ONE PIECE INCLUDING BASE AND INLET STUB WITH NO FIELD JOINTS. BASE MUST HAVE LEVEL INTERIOR. OMIT CONE. MUST BE AIR PRESSURE TESTED AT MANUFACTURING PLANT PRIOR TO SHIPPING.
4. 316 STAINLESS STEEL
5. ALL CONCRETE SURFACES SHALL BE STEEL TROWEL FINISHED WITH ROUND AND SMOOTH EDGES AND PAINTED WITH 2 COATS OF ACID RESISTANT EPOXY PAINT. ALL CONCRETE TO BE SULFATE RESISTENT (TYPE V, WITH SULFATE RESISTANT POZZOLAN) f'c = 4000 psi
6. ALL GEOTEXTILES TO BE 100% POLYPROPOLENE. (TESTED TO COMPLY WITH EPA 9090 MODIFIED.)
7. 8" SDR 11 SOLID POLYETHYLENE PIPE, 1 INCH THICK PLATE WELDED ON BOTTOM TO FORM LEVEL INTERIOR. FACTORY FABRICATED WITH WELDED JOINTS. ONE PIECE INCLUDING BASE AND INLET STUB. MUST BE AIR TESTED AT MANF. PLANT PRIOR TO SHIPPING. AS MANUFACTURED BY DRISCO PIPE OR EQUIVALENT.
8. LEAK DETECTION SYSTEM CENTERED BETWEEN THE TWO SOLUTION COLLECTION SYSTEMS. LEAK DETECTION WET WELL IS LOCATED IN THE SAME PLANE AS SOLUTION COLLECTION WET WELLS. SEE PLAN VIEW FOR CLARIFICATION.

Figure 2-9
Pond Details

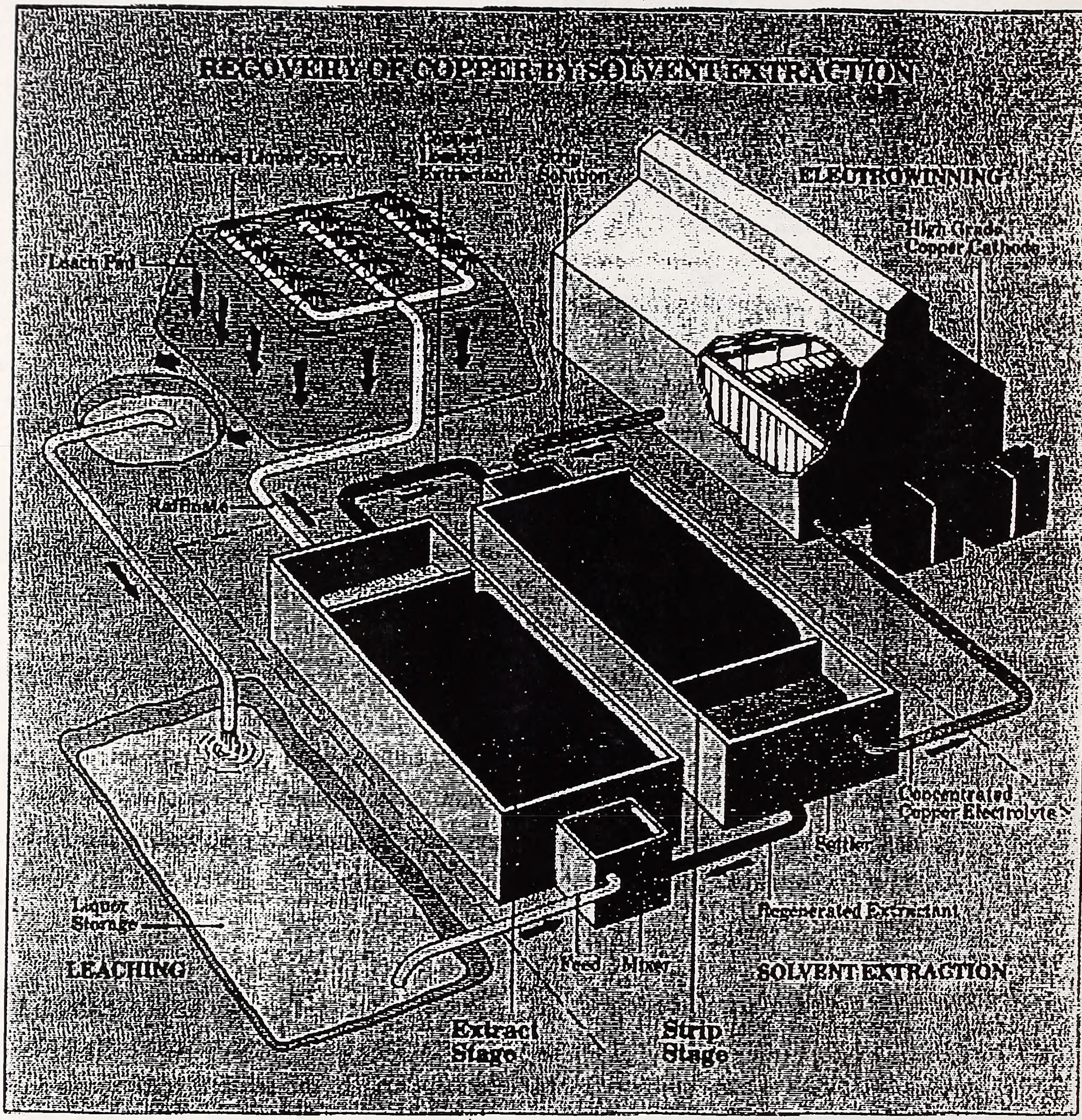
VECTOR ENGINEERING, INC.

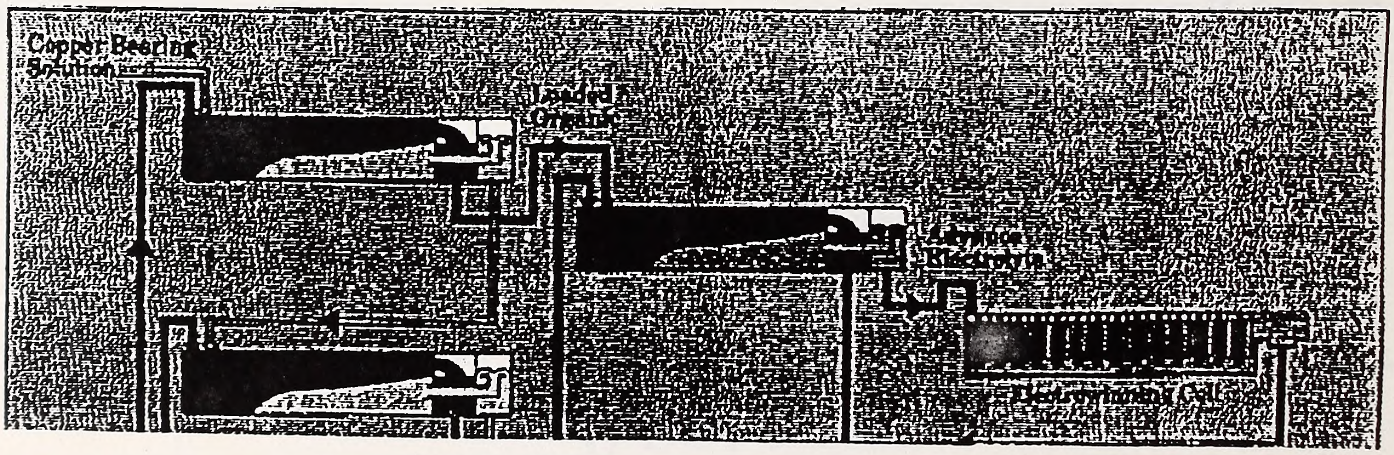
Grass Valley, CA • El Dorado Hills, CA • Carson City, NV

12438 Loma Rica Drive, Suite C Grass Valley, CA 95945 (916) 272-2448

Drawing Name	POND DETAILS
Location	GRAHAM COUNTY, ARIZONA
Drawing No	11
File Name	M20

Figure 2-10


RECOVERY OF COPPER BY SOLVENT EXTRACTION
ELECTROWINNING
High Grade Copper Cathode
Leach Pad
Raffinate
Concentrated Copper Electrolyte
Settler
Regenerated Extractant
Liquor Storage
LEACHING
Feed
Mixer
SOLVENT EXTRACTION
Extract Stage
Strip Stage


Copper Bearing Solution
Loaded Organic
Electrowinning Cell

The copper recovery process involves 3 closed loops, which can be described as follows:

- The stacked ore is leached with a weak acid solution, yielding a copper-bearing Pregnant Leach Solution (PLS), which flows either to the PLS pond or the recirculation pond. Solution from the recirculation pond is recirculated to the heap.

- The collected aqueous phase PLS is pumped to the Solvent Extraction tanks for upgrading, where the weakly-acidic PLS is mixed with extractant-bearing kerosene that extracts copper from and reacidifies the aqueous phase (now called raffinate).

- The copper-rich kerosene and barren raffinate are allowed to separate in large swimming pool like settler tanks. The reacidified raffinate is pumped back to the heaps to leach more copper, while the copper-rich kerosene is pumped to another tank where it is mixed with a highly acidic, copper-rich solution, the electrolyte.

- The highly-acidic electrolyte strips the copper from the kerosene, further enriching the electrolyte with copper. Depleted kerosene is then recirculated back to the extraction units to mix with PLS, while the enriched electrolyte is pumped to the electrowinning tankhouse.

- The electrowinning tankhouse consists of a number of large cells, like giant batteries, through which enriched electrolyte is circulated. A current is passed through the cells, causing ultrapure copper to be plated onto thin, meter-square stainless steel blanks. Depleted electrolyte flows back to the strip unit.

- In order to maintain the circulating electrolyte temperature at its set level, and to supply cathode wash water, a hot water boiler is provided. Make-up water for the boiler will be supplied by a pump from the potable water system. Hot water will be used directly for cathode washing, and will be passed through a heat exchanger to supply heat to the electrolyte.

- Copper cathodes are harvested weekly. Ultrapure copper cathodes weighing about 150 pounds each are stripped from each side of the stainless steel blanks, which are then placed back in the cells to plate out more copper. Copper cathodes are bound in approximate 5,000-pound bundles for shipment to traders or end users.

2.1.7 Project Support Facilities

The project support facilities will consist of buildings for mine maintenance, warehouse storage, administration, tankhouse and other facilities to support the mine and plant operations.

2.1.7.1 Buildings

All buildings are planned as pre-engineered steel structures with steel cladding on a concrete foundation. Planned shop facilities include:

- High maintenance bays served by an overhead traveling crane for rubber-tired equipment and tracked equipment. The bays will be sized to accommodate the largest piece of mine equipment with all-around access.

- A paved and curbed area for lube storage, located outside the building.

- An air compressor for air tools and lube distribution.

- A paved and curbed vehicle washing and tire changing area with sump and oil/water separator, located outside the building.

- Office space for mine and crusher maintenance and operating supervisors, planned as part of the truck shop. The building will be equipped with ventilation and heating systems, floor drainage with an oil/water separator, and a fire protection system.

The warehouse will include shipping and receiving areas, storage for spare parts, tools and supplies, lockers, showers and lavatory facilities for mine and crushing plant workers.

The administration building is planned as a single story, pre-engineered steel building with a concrete foundation. The building will provide office space for administrative and engineering staff.

The tankhouse at the plant site will include office and warehouse space for supervising, maintaining and operating the heap, solvent extraction and electrowinning circuits. A laboratory is also planned as part of the tankhouse building.

2.1.7.2 Reagent and Fuel Storage

Reagent and fuel usage is detailed in Section 2.1.7.3. The reagent storage area is in the tank farm at the plant.

<u>Sulfuric Acid (H_2SO_4)</u>

Ninety-three percent sulfuric acid will be unloaded from tank trucks by a compressed air unloading system. The acid will be stored in mild steel tanks, mounted on treated concrete bases. The areas surrounding the acid tanks will be curbed and will be provided with sumps and pumps. The containing volume of the curbed areas will be equal to the tank volumes. Tank overflow or leakage will be directed to a limestone-filled pit. Concrete around the tanks and acid transfer pump foundations will be protected with an acid-proof coating. These tanks will be located in the tank farm. The tanks will supply the acid used for ore curing and acid for make-up in the electrolyte.

<u>Fuel Oil and Gasoline</u>

No. 2 diesel oil will be used at the plant for boiler fuel. Diesel will be received in tank trucks and will be unloaded by a truck-mounted pump into a storage tank near the boiler.

No. 2 diesel oil will be used at the mine for fueling of mobile equipment and miscellaneous small uses. Unleaded gasoline will be used for fueling of pick-up trucks, sedans, and small gasoline-powered engines. Diesel and gasoline will be received in tank trucks and will be unloaded by truck-mounted pumps into storage tanks.

All fuel tanks will be above ground, and will be closed and vented as required by the appropriate state and federal agencies. Tanks will be enclosed in a curbed area with a volume greater than that of the largest tank. A sump will be provided within the curbed area to allow for removal of spilled fuels or water. Fuel oil and gasoline will be dispensed using Arizona Department of Transportation-approved pumps equipped with flow meters. All fuel areas will be protected from fire by a water/foam system.

<u>Kerosene</u>

Kerosene (Conosol Extraction Solvent or equivalent) will be used as a dissolving agent in the organic solvent make-up. Kerosene will be received in tank trucks and will be unloaded by a truck-mounted pump into a covered storage tank. The area surrounding the tank will be curbed and protected from fire hazard with a water/foam system.

Oxime Reagent

Drums of organic oxime reagent (Henkel LIX984 or ACORGA MS540) will be received close to the organic solvent preparation area. A barrel pump will be used to transfer the organic reagent to the mixer-settlers.

Cobalt Sulfate

Cobalt sulfate will be received by truck as an eight-percent solution. Cobalt sulfate will be unloaded by a truck-mounted pump into a covered storage tank. Cobalt sulfate will be pumped to the electrolyte recirculation tank to maintain the desired concentration level in the mixed electrolyte.

2.1.7.3 Reagent and Fuel Consumption

Reagent Consumption

Reagent	Average Daily Usage
Sulfuric Acid (93% strength)	500 Tons
Organic Reagent	76 Gal.
Kerosene	1,306 Gal.
Cobalt Sulfate	108 Lbs.

Explosives Consumption

Anticipated explosives usage is based on an overall powder factor of 0.35 lbs. explosive per ton blasted. The average daily usage is based on 12.0 million tons of ore and 13.0 million tons of waste rock (overburden) and alluvium mined per year. Five pounds of high explosives were allowed per hole for priming and initiation. Approximately 35 holes will be blasted each day.

	Average Daily Usage
Blasting Agents	12 Tons
High Explosives	175 Lbs.

Fuel Consumption

The fuel consumption estimate is based on computer simulation data for haul trucks and manufacturers data for other equipment, for an average production year. Diesel fuel consumption will average around 3 million gallons per year, and gasoline consumption will average around 45,000 gallons per year over the life of the project.

2.1.7.4 Spill and Leak Contingency/Remediation Plans

Spills

In the event of a pond spill during a period of high precipitation runoff, the solution would be diluted by the runoff and carried downstream. The following actions would be taken as soon as possible:

1. Emergency repairs would be made to prevent further releases.
2. Arizona DEQ and BLM would be notified.
3. Excess water in the process system would be reduced by increased spraying to enhance evaporation.
4. After runoff has ceased, stream sediment samples would be taken to check for residual contamination. Should residual contamination be present, AZCO would consult with the Arizona DEQ and BLM regarding the necessity for and methods of decontamination. Decontamination methods might include the addition of lime to the sediments to raise the pH and bind metallic ions in insoluble compounds.

In the event of a pond spill with no precipitation runoff, the solution would be expected to soak into the permeable sediments in the wash. The following actions would be taken as soon as possible:

1. Emergency repairs would be made to prevent further releases.
2. Arizona DEQ and BLM would be notified.
3. Excess water in the process system would be reduced by additional spraying.
4. The spill would be intercepted downstream and neutralized or pumped back to the process pond as directed by Arizona DEQ and BLM. Residual contamination in the sediments would be decontaminated as discussed above.

Leaks

Pond and solution ditch leaks will be detected by the integral leak detection system. In the case of a leak of sufficient magnitude to require repair (see Appendix D - Monitoring Plan), the level will be lowered and the repair made. The plant is designed with two identical ponds, the PLS and recirculation ponds, each with excess capacity. This allows complete pump-down of one pond for repair. The design also provides for parallel solution ditches. Flow can be diverted from either ditch to facilitate repair.

Significant pad leaks will be detected by either the groundwater monitoring wells or vadose zone monitoring wells. If a leak is detected, the Arizona DEQ and BLM will be notified, and

if warranted, a remediation program will be undertaken. Remediation could involve the installation of wells to pump fugitive solution to a process pond and/or shut-down of the leaking portion of the pad.

2.1.8 Ancillary Facilities

2.1.8.1 Electrical Power

Electrical power will be supplied by the Graham County Electric Cooperative. Current plans are to provide the main feeder to the plant site along the right-of-way for the existing 220KV line which passes within a few hundred feet of the plant site. The incoming 69KV will be stepped down to 4,160 volts for plant use and 13.2KV for transmission along a new line to the mine substation. The new line will run along the utilities corridor from the plant to the mine. The mine substation will provide 4,160 volts for local distribution within the mine area.

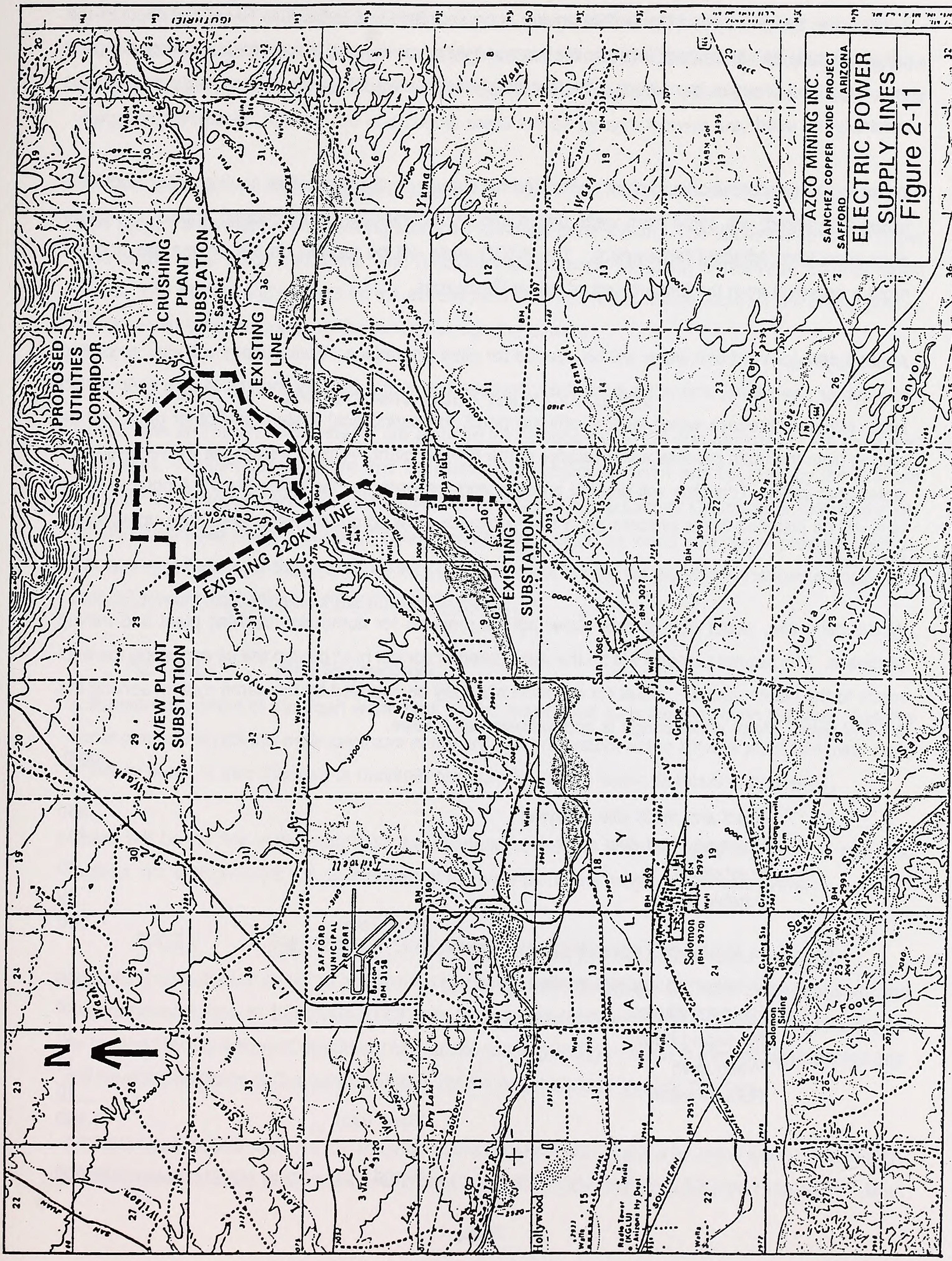
The mine substation may also receive power from an auxiliary incoming line from the existing (upgraded) line along Sanchez Road. This line would be built along the right-of-way for the existing decommissioned line which served a previous pilot operation on the site.

The planned electrical power supply system is shown in Figure 2-11.

Power consumption for motors was estimated from the flowsheets. All motors were assumed to be operating at 80% of rated output. Electrowinning power consumption was based on an average voltage drop of 2 volts per cell and average current efficiency of 94%. Electrical power requirements will be approximately 10 MW for the project. Electrical energy consumption will be about 87,600 MWH per year. Power demand will be steady, without large spikes, since major loads operate continuously or nearly continuously.

2.1.8.2 Water Source and Use

An average 1,600 gpm, or 2,600 acre-feet per year, of water is required for the life of the mine. (Water use could range from 1,000 to 2,000 gpm, depending on the time of year and weather conditions.) All of this water will be consumed on site, with no discharge except for septic tank sanitary waste effluent. As discussed in detail in Chapter 3, there are three separate aquifers on the project site -- the Upper Gila Conglomerate aquifer, the Lower Gila Conglomerate aquifer, and the Bedrock aquifer.


AZCO MINING INC.
SANCHEZ COPPER OXIDE PROJECT
SAFFORD ARIZONA
ELECTRIC POWER SUPPLY LINES
Figure 2-11
PROPOSED UTILITIES CORRIDOR
CRUSHING PLANT SUBSTATION
EXISTING LINE
EXISTING 220KV LINE
EXISTING SUBSTATION
SX/EW PLANT SUBSTATION
N
SAFFORD MUNICIPAL AIRPORT
Solomon
San Jose
Hollywood
Bennett
Yuma Wash
Big Canyon
GILA RIVER
VALLEY
SOUTHERN PACIFIC
Foote
San Simon
Lone Star

Additionally, the unconfined Upper Gila aquifer is present adjacent to the Gila River, just south of the proposed mine pit. The Upper Gila aquifer has good water quality and is used for human consumption and irrigation, whereas the Lower Gila Conglomerate aquifer has poor water quality and is thus generally not used.

Water for dust suppression and plant operations will come from the Upper Gila aquifer wells. Additional water, if required, will come from wells drilled into the Lower Gila Conglomerate aquifer, or will be purchased from adjacent landowners. The AZCO wells will be located on the project site and will require approval from the Department of Water Resources.

About 1,100 gpm of fresh water will be needed for plant operations. Water usage will vary according to weather conditions, and will substantially increase during the hot, dry months due to evaporation loss. Make-up process water for the raffinate pond, the curing acid system and other uses, will be tapped from the main process water header at the SX-EW plant. A fresh water tank will receive fresh water from wells. This tank will provide process and fire water for the entire plant. A potable water tank will be installed at the process plant site to provide drinking quality water and make-up water for the boiler.

At the mine site, about 500 gpm of water will be required for domestic, crushing plant and mining purposes. The largest demand will be the water used to control road dust in the pit and along the haul roads to the waste dumps. Water for the mine site may be supplied by the same system serving the SX-EW plant. Major water usage is approximated as follows.

			gpm
MINE:			
	Road and muck pile spraying		350
	Crushing plant dust control		100
	Washdown		40
	Potable water		10
		Mine Total	500
SX-EW PLANT AND LEACH PAD:			
	Evaporation and ore wetting		1,000
	Reagent dilution		70
	Packaged boiler		10
	Washdown		10
	Potable water		10
		Plant Total	1,100
		Grand Total	1,600

2.1.8.3 Access Roads

Access to the mine area will be from the realigned Sanchez Road. Access into the processing area will be from the Solomon Pass Road. Within the property boundary, internal access routes will be company controlled. Access into operational areas will be by appointment only.

2.1.8.4 Drainage Control

The project area has an engineering designed drainage control plan. The ditches around the upper side of the heap leach pad, mine, and northern waste dumps will divert a 100-year, 24-hour storm event. The ditches and culverts on the access road and haul roads will be sized for the drainage area which would be contributing to the runoff through the culvert.

2.1.8.5 Sanitary and Solid Waste Disposal

Septic tank and leach field systems are planned for sewage treatment and disposal at the mine and plant sites. System specifications and installation are subject to review and approval by the Graham County Health Department. The San Jose transfer station or the Central County Landfill will be used for non-toxic solid waste disposal. These solid wastes, such as wood and paper products, will be transported to either of these sites by AZCO. These wastes will be stored in a fenced containment area to prevent scattering until the transfer is made.

2.1.8.6 Fire Protection

A substantial portion of the fresh water tank will be maintained as a fire protection reserve. Two fire water pumps will provide water pressure to the fire hydrant system at the SX-EW plant and mine area. A jockey pump is also planned to maintain pressure in the fire water distribution system.

There will be no fire water supply to the overland conveyors from the crushing plant to the pad. Instead, fire extinguishers will be installed at intervals along the length of the conveyors.

2.1.8.7 Hazardous Substances and Waste Disposal

All hazardous substances will be transported by commercial carriers or vendors in accordance with the requirements of Title 40 CFR, Title 49 CFR and Title 28 ARS. Carriers will be licensed and inspected as required by the Arizona Department of Transportation (ADOT). Tanker trucks will be inspected and will have a Certificate of Compliance issued by the Arizona Motor Vehicle Division.

All hazardous substances will be handled in accordance with applicable Mine Safety and Health Administration (MSHA) or Occupational Health and Safety Administration (OSHA) regulations. Most

of the hazardous substances to be used at the mine (fuels, oils, lubricants, kerosene, packaged chemicals, ammonium nitrate) do not require special handling. High explosives and sulfuric acid will be handled only by specially trained personnel with appropriate protective and handling equipment.

All hazardous substances will be handled in a manner to avoid spills, and areas in which hazardous materials are handled will be designed to contain spills. All spills will be cleaned up or neutralized as appropriate. Washdown water from equipment cleaning in the shop areas will be processed through an oil/water separator.

Hazardous wastes generated by the mining company (the only anticipated hazardous wastes are used oils and solvents) will be packaged and shipped off site as required by state and federal law for recycling or disposal as appropriate. EPA Hazardous Waste Manifest forms will be prepared as required.

2.1.9 Reclamation and Closure Plan

2.1.9.1 Reclamation Goals

The long-term objective of the reclamation plan is to establish a post-operational environment compatible with the post mining land use of the site. Specific goals of the reclamation plan are to:

- Create erosionally stable landforms for the heap leach pad, waste rock dumps, and other disturbance.
- Divert ephemeral drainages around the heap leach pad, waste rock dumps, and mine pit.
- Create a post-mining topography for facilities sites and roads that blends with the adjacent natural topography.
- Eliminate safety hazards by neutralizing heap leach pads and ponds, and by placing earthen berms and barriers around the pit where necessary to discourage access.
- Revegetate all disturbances (except the mine pit, heap slopes, and dump slopes) with native plants that have a high value to wildlife and cattle and are capable of producing a self-sustaining community.
- Restore the land to long-term, multiple use.

To accomplish these goals, BLM will designate a Reclamation and Post-Closure Site Management Committee, consisting of AZCO officials, BLM employees, county representatives, and interested

citizens. This group will develop a long-term management plan for the site, at least five years prior to mine closure, which details how the site will be managed. The management goals for this plan will be:

- Environmental enhancement;
- Minimization of long-term monitoring costs associated with mine closure;
- Maximization of long-term benefits to the local community;
- Assistance and support of the county's efforts to diversify the county's economic base, through improvement of tourism; and
- Assurance of long-term productive use of the site.

2.1.9.2 Decommissioning

Concrete Foundations

Foundations of the buildings, crushers, and SX mixer/settler units will be buried in place. Facility areas will be recontoured to promote drainage.

Drill Holes

All drill holes, especially artesian wells, if any, will be considered for use in range or wildlife projects by the BLM; all wells not needed for this purpose outside the pit will be plugged to meet Arizona's hole-plugging standards, as regulated by Arizona Department of Water Resources.

Solution Ponds

Water in the processing ponds will be allowed to evaporate after operations cease. All structures and piping will be removed. Any silt or sediments remaining in the ponds will be checked for toxicity. If they are toxic, detoxification procedures will be followed, or the material will be removed and disposed of according to Arizona DEQ regulations or other applicable state and federal regulations.

The pond liners will be removed from the surrounding berm and sides, and will be folded into the pond bottom. The liner on the bottom will be punctured to prevent ponding. The ponds will then be backfilled.

Heap Leach

The leached ore on the pad will be rinsed with fresh water or neutralized raffinate using the existing distribution system. The effluent from the heap will be monitored for pH. The rinsing will continue until the effluent pH is 6 or higher. Lime will be added if necessary to achieve an appropriate pH. The

distribution system will also be used to evaporate the excess water. When the return flow is minimal, operations will cease, and the heap leach will be allowed to dry out. The exposed liner at the toe of the heap will be cut and folded into the drainage ditch. The ditch will then be backfilled.

Equipment Disposal

All buildings and equipment will be removed from the site. All containers and barrels will be disposed of under applicable state regulations.

2.1.9.3 Final Contours and Slopes

Waste Rock Dump

The top surface of the main waste rock dump will be built to slope gently (1% to 4%) from the dump crest to the hillside at the western edge. The backslope is designed to keep storm runoff from running over the dump crest and eroding the side slopes. The top of the dump will be maintained with a fairly smooth surface for later application of coversoil. Side slopes will be constructed at the angle of repose (1.38:1), and no additional grading is proposed. They will naturally stabilize and may appear prominent for several years.

Heap Leach Pad

The final surface contour of the heap leach pad will direct runoff away from the edges toward the center to minimize runoff eroding the faces of the heap. The top surface will be compacted and graded fairly smooth to accept the coversoil. The side slopes of the heap will be constructed at an average 2:1 slope with a four-foot bench every 20 to 30 feet. No additional grading or work is planned for the side slopes, which will stabilize naturally, and may be noticeably visible until natural revegetation occurs.

Mine Pit

No final contouring is planned for the mine pit. Roads, slopes, benches and rims will be maintained during the life of the operation and will be in a stable condition when operations cease. The design slopes are 42 degrees to 57 degrees depending on rock type. The haul road and safety bench will be left intact.

Solution Ponds

After the ponds are dry and final disposition of the liners has been accomplished, the ponds will be backfilled. The backfill material will be waste rock, and it will be compacted and mounded over the pond to promote runoff. The final contour will be approximately 5:1.

Diversion Ditches

Ditches which will not be required after operations cease will be graded and contoured. The edges of the ditches will be rolled in and compacted. The contour or slope will match the surrounding area.

Roads

Roads which are to be reclaimed will not be sloped or contoured; however, they will be ripped before coversoil is spread over the surface.

2.1.9.4 Revegetation Plan

Soil Salvage and Storage

A soil salvage plan was developed to determine amounts of soil to be salvaged. The physical and chemical properties of the potentially salvageable soils will be tested and salvageable depths and volumes estimated.

The project site is characterized by five soil mapping units with salvageable reclamation materials ranging from 0 to 29 inches in depth. Prior to disturbance, all salvageable soil materials will be removed, stockpiled on approximately 20 acres, and protected from wind and water erosion. Slopes of storage pile will be 3:1 or less and seeded with native perennial grasses. The storage piles will be sprayed with a BLM-approved herbicide to eliminate weed infestation, if required.

Since the heap leach pad and waste rock dumps are developed in phases, it may be possible on a portion of the area to remove the soil material and apply it directly, and thus, omit stockpiling.

Prior to soil salvage, state-protected plants will be offered for salvage under permit from the Bureau of Land Management with tags and seals from the Arizona Department of Agriculture. Cacti or other plant materials left on site which are useful in the reclamation operation will be removed and immediately planted on the reclaimed surfaces or stored for later use, depending on the reclamation schedule.

Surface Preparation

Prior to application of the soil, compacted areas of the heap leach pad, waste rock dump, roads, ponds and diversion ditches will be ripped on 1.5 to 2.0 feet centers and to a depth of 12 to 18 inches to increase water infiltration, decrease the potential of erosion, and enhance plant root penetration.

Soil Replacement

Following completion of the surface preparation, soil will be either removed from storage or the undisturbed surface and applied to the heap leach, waste rock dump, roads, ponds, and other areas to be reclaimed. Depending on availability, soil will be applied to a depth of 3 to 6 inches.

Seedbed Preparation

Immediately prior to seeding, the seedbed will be worked to a depth of 4 to 6 inches with a chisel plow with shanks spaced no greater than 10 inches on center or a heavy duty disc. For areas to be drill seeded, the soil surface will be smoothed and packed as necessary to achieve a uniform, firm seedbed condition. For areas to be hydro-seeded, the soil surface will be left rough or, if necessary, roughened by harrowing to provide a surface favorable for seed catch.

Fertilization

The soils available for reclamation will be tested for nitrogen, phosphorus, potassium and appropriate rates of application developed. Fertilizer will be worked into the upper six inches of soil prior to seeding.

Test Plot Research

Prior to revegetation, test plots will be established to evaluate plant species to be used in revegetation, suitability of soil, fertilizer and amendments, and to determine initial irrigation requirements.

Plant Species Selection

Table 2-4 identifies numerous trees, shrubs, grasses and forbs potentially useful for reclaiming disturbances at the project site. A review of revegetation practices and research on area reclamation projects will be used to narrow the plant list and select those species to be evaluated by the test plot research.

Irrigation

Test plot research will determine the practicality of irrigation to initiate germination and then produce plant establishment.

Soil Depth

Soil depth treatments to be evaluated may range from 3 to 12 inches.

Seeding Methods

Areas to be revegetated will either be drilled or hydro-seeded. A rangeland-drill or seeder-cultipacker, with three separate seed boxes for large, fluff, and fine seed types, will be used to ensure uniform seed application.

Table 2-4
PLANT SPECIES BEING CONSIDERED FOR REVEGETATION

Scientific Name	Common Name
Trees and Shrubs	
Acacia constricta	Whitethorn acacia
Acacia greggii	Catclaw acacia
Atriplex canescens	Fourwing saltbush
Baccharis sarothroides	Desertbroom
Cercidium floridum	Blue palo verde
Cowania mexicana	Cliffrose
Encelia farinosa	Brittle brush
Ephedra nevadensis	Nevada Mormon tea
Eriogonum fasciculatum	Flat-top buckwheat
Eurotia lanata	Winterfat
Fallugia paradoxa	Apache plume
Larrea tridentata	Creosote bush
Grasses	
Andropogon barbinoides	Bluestem
Aristida purpurea	Purple three-awn
Bouteloua curtipendula	Sideoats grama
Bouteloua eriopoda	Black grama
Elymus triticoides	Creeping wildrye
Festuca megalura	Foxtail fescue
Hilaria jamesii	Galleta
Setaria macrostachya	Plains bristlegrass
Sitanion hystrix	Bottlebrush squirreltail
Sporobolus airoides	Alkali sacaton
Sporobolus cryptandrus	Sand dropseed
Trichachane californica	Arizona cottontop
Forbs	
Abronia villosa	Sand verbena
Anagallis arvensis coerulea	Weatherglass
Asclepias tuberosa	Butterfly flower
Baileya multiradiata	Desert marigold
Cassia Covesii	Desert senna
Centaurea cyanus	Bachelor button
Eriogonum umbellatum	Sulfur flower
Gaillardia pulchella	Firewheel
Linum Lewisii	Blue flax
Lupinus arizonicus	Desert lupine
Oenothera pallida	White evening primrose
Penstemon Parryi	Parry's penstemon
Ratibida columnaris forma pulcherrima	Mexican hat
Sphaeralcea ambigua	Desert globemallow

Mulching

Organic mulches will be used to conserve moisture, reduce soil temperatures, prevent erosion, and supply organic acids and essential plant nutrients. If the area is to be drill seeded, straw free of weed seed will be applied at the rate of one to two tons/acre and crimped into the soil with a disc or other equipment to prevent wind and water loss.

Schedule

Seeding will occur in the early summer prior to onset of the summer rainy period.

Management

The newly seeded area will be protected from livestock grazing for a period of 3-5 years after seeding. The new seedings may require supplemental nitrogen the second or third year and may also require weed control. The reclaimed areas will be monitored by the BLM to determine areas that may need reseeding or repairs from wind or water erosion. If the area is to be hydro-seeded, mulch will be applied with the seed and following seeding. Wood fiber and a tackifying agent will be applied at the rate of one to two tons/acre. Once the vegetation is established, and before the reclamation bond has been released, unnecessary fences will be removed.

2.1.9.5 Sediment Control

The diversion ditches, channels, retention ponds, and sediment traps will be left in place. The area will require several years to stabilize and regain vegetation which will minimize water erosion. During the 17-year mine life, the ditches will be monitored, maintained, stabilized and revegetated, thereby allowing permanent sediment control and runoff diversion after closure. The ditches will be designed to have a gentle slope (about 1%), which will minimize erosion in the ditch bottoms.

The sediment control ponds can be used for wildlife and cattle watering tanks, and should be beneficial to the area. The BLM will determine which structures should be maintained and which should be reclaimed prior to the closure of the project.

2.1.9.6 Reclamation Release Criteria

The reclamation bond shall be released when:

- All landforms have been established to minimize wind and water erosion.
- Natural drainages have been reestablished, where possible.
- Safety hazards have been eliminated.
- Native vegetation has been established on reclamation areas.

2.1.9.7 Surety Bond

The BLM surety bond amount has been calculated based on the reclamation plan presented in the proposed action. The surety bond estimate is presented in Appendix A. Because of the long life of the project, the BLM has decided to base the bond amount on three-year increments. Therefore, the initial bond amount is based on projected disturbances occurring during the first three years of the mine life, and will be adjusted accordingly using this same criteria each third year throughout the life of the mine. The initial bond calculation is presented in Appendix B.

2.1.9.8 Trust Fund

A trust fund will be established to provide funding for maintenance of fencing and other barriers after closure and bond release. The term of the trust fund will commence at the time of bond release and extend for five years. The amount will be $50,000 (1992 dollars).

2.2 Alternatives to the Proposed Action

Alternatives to the proposed action, or components of the project, which were considered include:

- No Action alternative;
- Alternative access route;
- Alternative heap leach pad configuration;
- Alternative groundwater disposal techniques;
- Alternative reclamation techniques; and
- Partial backfilling of the pit.

Alternatives which were eliminated from consideration and from detailed analysis include:

- Underground mining;
- Complete backfilling of the pit;
- Processing using mill and tailings;
- Waste rock disposal in Head Canyon; and
- Heap leach pad south of the pit.

Reasons for elimination of these alternatives are discussed in Section 2.2.6.

2.2.1 No Action Alternative

The No Action alternative is required to be included in a discussion of alternatives by NEPA and the regulations enforcing it [40 CFR Part 1502.14(d)]. The No Action alternative serves as the baseline for comparing and evaluating the environmental consequences of the proposed action and the various alternatives. The No Action alternative would allow no further mineral development on the public lands in question.

The No Action alternative conflicts with the General Mining Laws, the Federal Land Policy and Management Act (FLPMA) of 1976 and the regulations enforcing it (43 CFR 3800), and the Mining and Mineral Policy Act of 1970. In accordance with these laws and regulations, the claimant is granted rights to explore for, extract and process in a reasonable manner the mineral resource for which he holds claims. The BLM has the responsibility under FLPMA and under the regulations governing mining activities under the general mining laws on BLM-managed lands (43 CFR 3809) to ensure that:

- Appropriate state and federal laws such as the Endangered Species Act and the National Historic Preservation Act are complied with;
- Proposed operations do not cause unnecessary or undue degradation of federal lands; and
- Reclamation of disturbed areas is included in the proposed plan.

The BLM can disallow proposed mineral development activities only if they would violate applicable state and federal regulations and/or BLM standards. In such an instance, the BLM is then required to describe the changes in proposed activities needed to meet the requirements for development.

2.2.2 Alternative Access Route

The alternative access to the project site (Figure 2-12) would have been on existing roads. The project site is on the north side of the Gila River from the town of Safford. There are two existing bridges and two separate routes to reach the existing section of the Sanchez Road on the north side of the river. One route is to travel east from Safford on U.S. Highway 70 to the town of Solomon. At Solomon, the county road from Highway 70 proceeds north (Sanchez Road) to the Solomon Bridge. After the road crosses the river, it curves to the right and proceeds east for 5 miles, where it crosses the southern boundary of the project property.

The second route heads north from Safford on 8th Avenue and crosses the Gila River via the 8th Avenue (Safford) Bridge. The county road, referred to as the Airport Road, heads north and east past the airport and then curves south to connect with the Sanchez Road on the north side of the river.

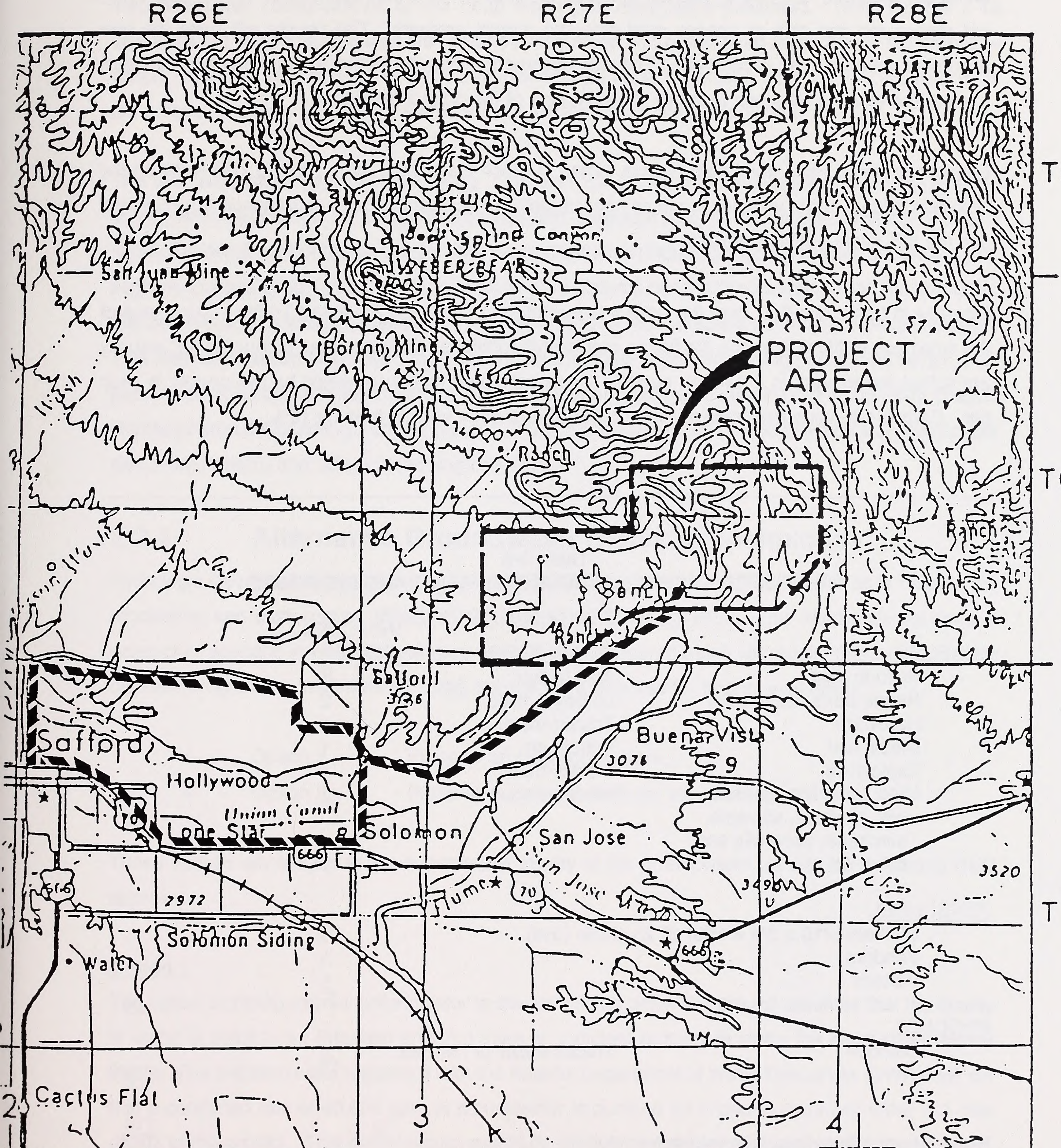


Figure 2-12
Alternative Access

All of the access routes are paved, except for the last mile of access (Sanchez Road) to the project entrance. Recently, the county has commenced construction of a new segment of county road which will realign the last mile of access road onto the project property. The county will pave the new alignment once the road is complete. The new alignment continues across the property and connects back to the existing Sanchez Road on the east side of the project boundary.

Employees would have used both access routes to reach the project area. Due to load limits on the Solomon Bridge, larger vehicles (such as service, delivery and copper cathode transport trucks) would use the 8th Avenue (Safford) Bridge.

Increase in traffic resulting from the project is indicated in Table 2-5 Projected Traffic. Calculation of the employee traffic utilizes the 3/4 factor, due to shift rotations. Only three out of four "shifts" actually are scheduled to work in a 24-hour period. It was estimated that there would be two people in each car. Carpools or vans may reduce the number of employee vehicle trips by 10%.

Table 2-5
PROJECTED TRAFFIC USING ALTERNATIVE ACCESS ROUTE

	TRUCK TYPE	VEHICLES PER DAY	
SUPPLIES			
Sulfuric acid	Acid tanker	20	
Repair parts/assemblies	Lo-boy & misc	2	
Hardware	Tractor-trailer	2	
Diesel fuel	Petroleum	1	
Explosives	Tractor-trailer	1	
Misc. (gasoline, gasses, oils, greases, solvents, kerosene, used oils and solvents)	Miscellaneous	2	28
PERSONNEL			
Workers [210 x 3/4 = 158] @ 2/vehicle (ave)		79	
Vendors		5	
Visitors		5	89
PRODUCT			
Cathode	Tractor-trailer or flat bed	2	2
			119

Source: Mining & Environmental Consultants, Inc., 1992

2.2.3 Alternative Heap Leach Pad Configuration

Two alternative configurations of the heap leach pad have been evaluated. (See Figures 2-13 and 2–14.) The two alternatives are within one thousand feet of the heap leach pad in the proposed action. The two alternatives are in the same hydrologic area, vegetation type, and wildlife habitat as the proposed action. Aesthetics would also be similar to the proposed action.

The two alternatives differ in topography. One alternative pad (Figure 2-13) has an average slope of 1%, which is too flat for effective drainage and collection and would be problematical with any significant settlement of the pad base. The other alternative (Figure 2-14) requires two separate pads, each with slopes up to 14%. This second alternative disturbs 50 to 100 acres more than the proposed pad and requires extensive pipelines across Head Canyon with attendant potential for leaks and spills. This alternative would also create the need for an additional set of processing ponds, one set for each pad. All other leach pad sites in the project area are unacceptable due to adverse topography, greater distances from the crushing plant, or greater potential impacts to surface and groundwater, vegetation, aesthetics, wildlife and adjacent farming operations.

2.2.4 Alternative Groundwater Disposal Techniques

Hydrologic investigations indicate that the pit will not intercept as much groundwater as is required for processing and dust control. [SHB, 1989; Geothermal Surveys, 1992] This alternative assumes a worst-case scenario in which excess groundwater is encountered which will require that a groundwater disposal program be implemented. Two options were selected for impact evaluation:

- Option 1 - Pump to an irrigation system;
- Option 2 - Pump to a series of wells for injection.

These options are subject to the quantity and quality of the groundwater, as well as to Arizona DEQ approval.

Option 1

The option of piping excess groundwater to the farm fields below the project assumes that the quality of water is suitable for irrigation and that there is sufficient quantity to make the effort economically viable. The irrigation wells registered with the Arizona Department of Water Resources (DWR) indicate that a combined rate of 40,000 gpm of groundwater is pumped for irrigation purposes within a 3-mile radius of the project. This option would substitute deep groundwater for shallow groundwater during the irrigation season, and would put the excess groundwater to a beneficial use.

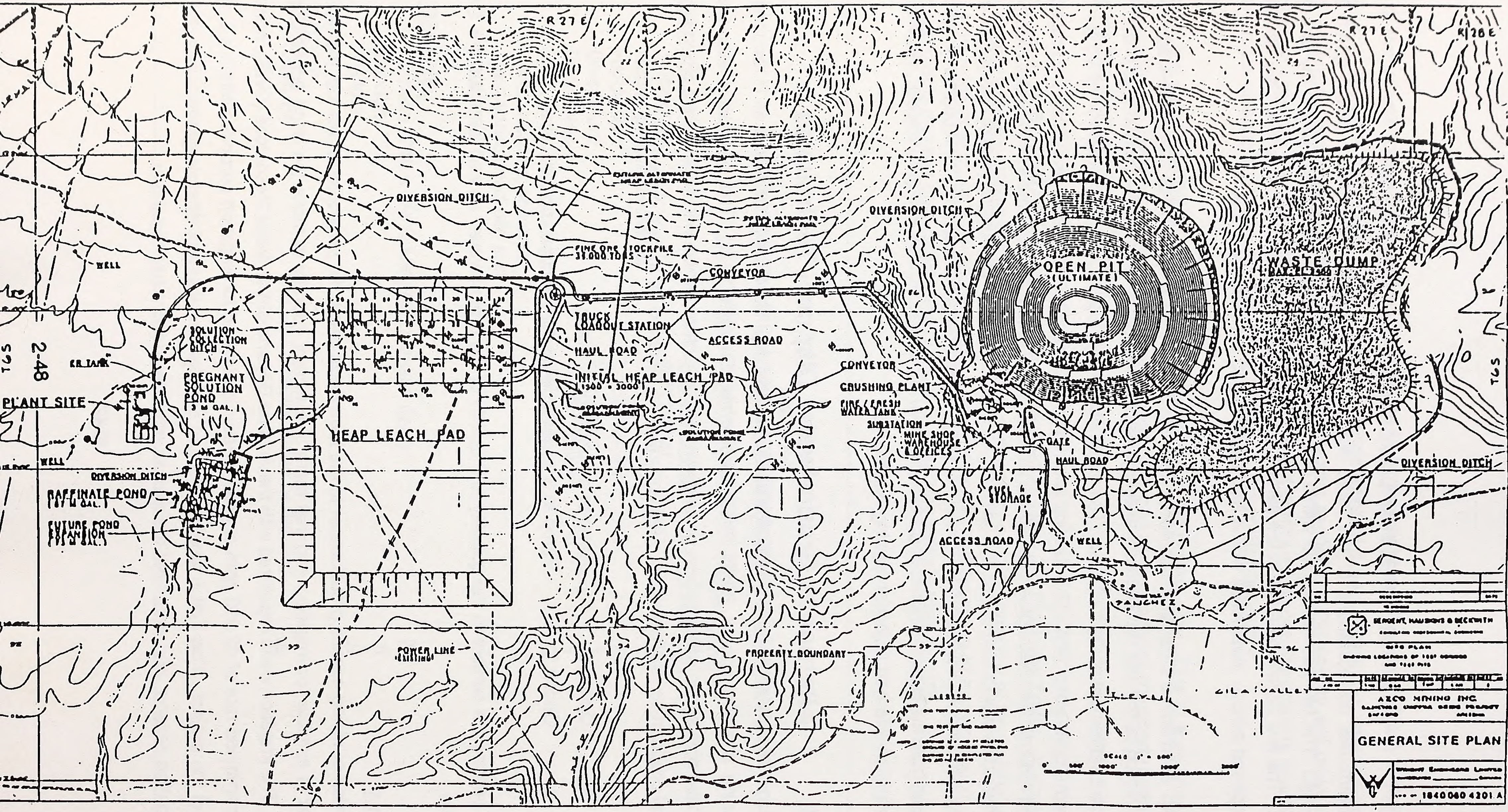


Figure 2-13
Alternative
Heap Leach Pad

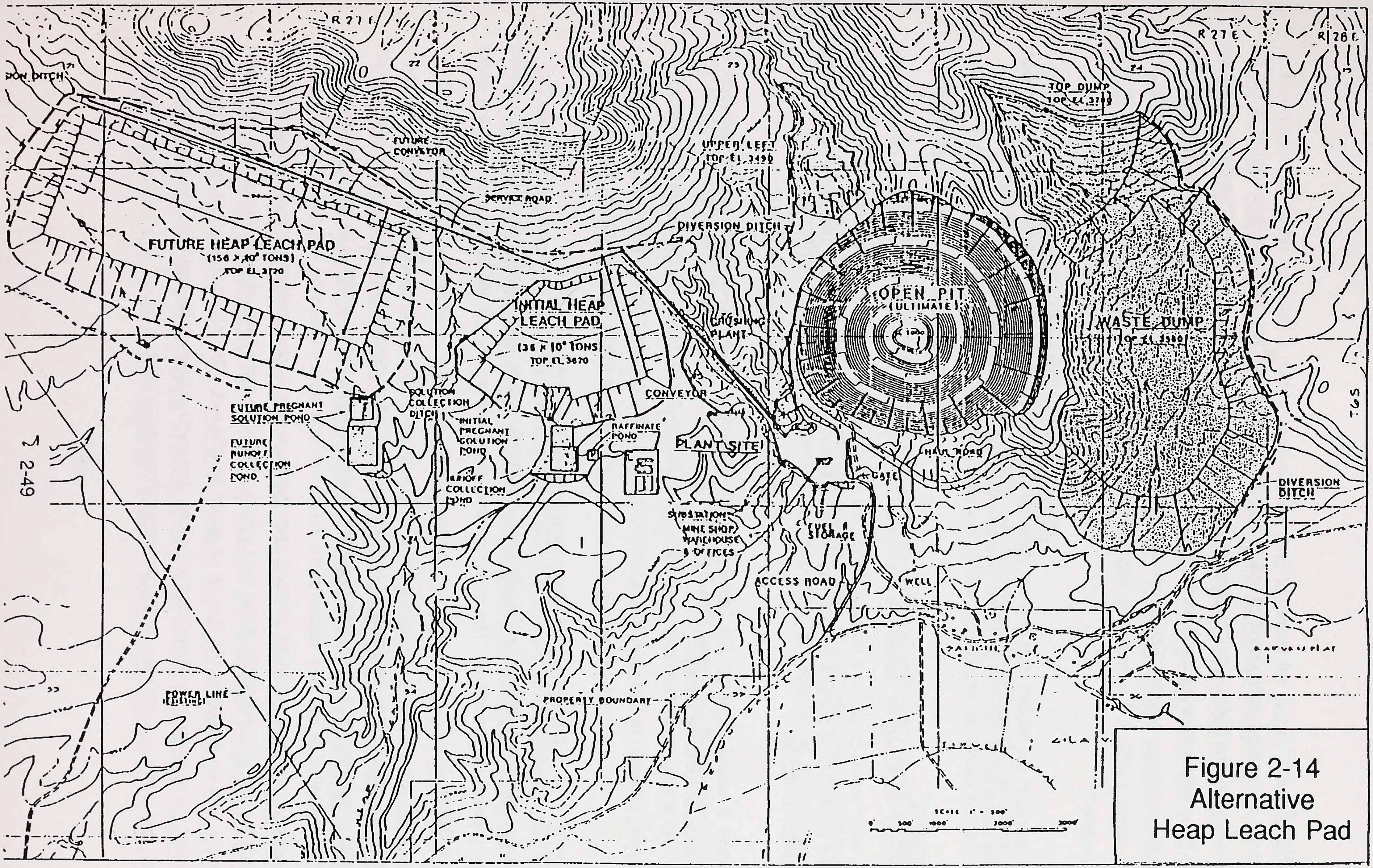


Figure 2-14
Alternative
Heap Leach Pad

Option 2

A series of injection wells would be drilled at an appropriate location, and deep groundwater would be reinjected into the Lower Gila Conglomerate aquifer. The wells would be cased with perforated casings and fitted with pumps mounted on the surface. The excess water would be pumped under pressure into the subsurface strata. This option assumes that the excess groundwater is of a poor quality, and that Arizona DEQ will only permit disposal into the same aquifer from which the groundwater was intercepted.

Compared to the 40,000 gpm of water currently pumped for irrigation in the area, excess groundwater to be disposed of from the pit is not expected to be of significant quantity.

Summary

Option 1 would slightly reduce the draw down in the Upper Gila aquifer from irrigation demand, and the water would be put to a beneficial use. No energy savings are anticipated, because the electricity used by AZCO to pump the water would be a substitute for the electricity used by farmers during irrigation pumping.

Option 2 would recharge the Lower Gila Conglomerate aquifer and would reduce alteration or degradation of other aquifers.

2.2.5 Alternative Reclamation Techniques

Various landforms created by the proposed action will remain following the completion of the mining and processing operations. The major landforms created are the pit, the heap leach, and the waste rock dumps.

The side slopes of the proposed heap leach could be left in various slopes and configurations which could affect the total surface area disturbed as well as revegetation efforts. To enhance the success of revegetation of the side slopes of the heap, the side slopes would be reduced to as low as 3:1. Additional coversoil would be stripped from the previously undisturbed areas surrounding the leach pads for use in covering the flatter side slopes. The side slopes would be flattened after operations cease, and an additional 100-200 acres would be affected. This alternative would increase the total amount of acreage revegetated for the project. The heap leach pad has been sited on a creosote bush flat, and creosote bush may be the preferred revegetation plant.

The waste rock dump area has a combination of very steep to almost flat slopes. The steep slopes are extremely rocky and offer limited coversoil for recovery and stockpiling. Flattening the side slopes of the waste rock dump should be a function of the availability of coversoil on the project site. Topsoil or coversoil imported would increase the total disturbance for the project. Sufficient coversoil is available to cover the north slope of the waste rock dump. This would increase the total acreage for revegetation by about 50 acres.

2.2.6 Partial Backfilling of the Pit

Partial backfilling of the pit was suggested during public comment on the Draft EIS as a method of preventing water accumulation in the bottom of the open pit after abandonment. Water accumulation in the bottom of the open pit could result in:

1. water pollution which might be harmful to wildlife or which may flow back into the aquifer; or
2. the cone of depression in the groundwater table due to inflow to the pit having a negative impact on the Upper Gila aquifer, which is widely used for irrigation and domestic purposes.

A study by Geothermal Surveys Inc. (GSi, 1992) indicated that under the most likely scenario, groundwater inflow from the Upper Gila Conglomerate and Bedrock aquifers following mine cessation would be 170 gpm and 250 gpm respectively, and that outflow due to evaporation would be about 710 gpm. As such, ponding would occur ephemerally in the pit, only after precipitation.

GSi also concluded that the local dewatering of the Upper Gila Conglomerate aquifer and the inflow to the pit from the Bedrock aquifer will not have a measurable effect on the Upper Gila aquifer.

GSi determined the quality of the water in the Bedrock aquifer from samples drawn from a monitor well and core holes. The water quality was very similar to water samples drawn from the Upper Gila Conglomerate and Upper Gila aquifers. Except for one core hole with a slightly elevated level of silver, heavy metals were all below detection limits. Chloride levels were fairly high, typical of local aquifers.

Water which accumulates in the pit will be in contact with mineralized wall rock, but should not change quality. Even at the pit bottom, the orebody is highly oxidized, with only minor sulfides. All samples of rock taken from core holes in the orebody were tested and found to have acid neutralization potentials from 4 to 40 times their acid-generating potential. While none of these samples were from the pit bottom, the rock types are the same and would be expected to have the same high acid

neutralization potential. Water drawn from the core holes which has been in intimate contact with the ore body is basic and does not have a high heavy metals content.

If a permanent water body exists in the pit, the dissolved solids content can be expected to increase as the water evaporates. The water may become saline, and some constituents may precipitate as salts. This is a common occurrence in ephemeral ponds with no outlet in arid climates.

Assuming any such permanent water of unacceptable quality accumulates in the pit, the pit may be backfilled to the extent necessary to cover the pond. Partial backfilling would reduce the size of the waste rock dump, but would incur proportionate adverse impacts discussed in Section 2.2.7.2.

2.2.7 Alternatives Eliminated from Consideration

This section discusses alternatives to the proposed action or portions of the project which were eliminated from further consideration and analysis in the environmental assessment. Eliminated alternatives include: underground mining; complete backfilling of the pit; processing using a mill and tailings; waste rock disposal in Head Canyon; and locating a heap leach pad south of pit.

2.2.7.1 Underground Mining

The alternative of mining the deposit by underground methods has been eliminated from further consideration. The ore deposit outcrops on the surface and is a low grade deposit. In order to mine the deposit underground, a large portion of ore would be left on or near the surface to prevent subsidence. The structure of the rock is weak, and large underground excavations would likely collapse, making mining extremely unsafe. The overall project as evaluated for underground mining is technically not feasible. A low-grade, high tonnage deposit of this type, because of its shape and grade distribution, is only minable by the open pit method.

2.2.7.2 Complete Backfilling of the Pit

Backfilling of waste rock and spent ore into the open pit during mine closure was evaluated and determined to be infeasible based upon economics and environmental issues. Approximately 200 million tons of waste rock would be removed from the pit. Another 200 million tons of ore would also be removed and placed on the heap leach pad. The ore and waste can be expected to "swell," and approximately 25% of the material removed would not fit back into the pit. At an estimated cost of $1/ton, based on current loading and hauling costs, the cost of backfilling the pit would be $400 million. Such increased project costs would raise the cutoff grade and render the project uneconomical.

Mine development precludes simultaneous backfilling of the open pit. All waste rock and ore must be removed from the pit and relocated to the leach pad or waste rock dump before backfilling could commence, thereby disturbing the same acreage as the proposed action. After the waste rock would be replaced into the mine pit, the stockpile footprint would need to be reclaimed. If the spent ore on the heap leach pad is not used as backfill, a partial pit would still remain. If enough spent ore was used as backfill, the heap leach pile would still contain 80 million tons (likewise allowing for 25% swell). Rehandling of waste rock and spent ore to backfill the mine pit could result in:

- Increased water use for dust control;
- Lengthened project life and associated impacts to adjacent and off-site resources;
- Extended duration of particulate production;
- Increased fuel use and associated emissions; and/or
- Unstable ground conditions at the pit site.

Backfilling of the pit was also eliminated from further consideration based on 43 CFR 3809.0-5(j), which states that reclamation may not be required where the retention of a stable highwall or other mine workings is needed to preserve evidence of mineralization.

2.2.7.3 Processing Using Mill and Tailings

Ore milling was considered and rejected for the following reasons:

- Additional equipment would be required -- mills, classifiers, leaching vats, large diameter clarifiers and tailings thickeners -- which would increase the capital cost of the project and the environmental impact.

- In milling, the ore is finely ground, and a large impoundment would be required for the leached waste (tailings). Since tailings are inherently less stable than crushed rock (as in a leach heap), a larger area would be covered by an impoundment than a similar tonnage leach heap.

- Tailings impoundments are more difficult to reclaim than leach heaps. Tailings have a sand to clay consistency and never thoroughly dry except near the surface. It is difficult to work on the surface of an impoundment with reclamation equipment.

- Portions of impoundments where the surface has dried can emit large quantities of fugitive dust in high winds.

- Milling requires more water than leaching, since a large quantity of water is unrecoverable from the mill tailings.

- The decision to mill or leach ore is usually made on an economic basis. Milling is more expensive, but usually results in quicker and higher recovery. Milling is often justified for high-grade deposits, but not for low-grade deposits (like Sanchez).

2.2.7.4 Waste Rock Disposal in Head Canyon

Disposal of waste rock in Head Canyon was eliminated from further consideration. Head Canyon is a major drainage in the project area; filling it would thus have a major, long term impact on the drainage systems in the local area. The additional moisture in the drainage supports a shrub community typical of the Sonoran desert. Portions of the drainage meet the definition of "waters of the U.S.", as defined in the Regulatory Programs of the Corps of Engineers, published in the Federal Register on July 22, 1982. Filling Head Canyon with waste rock would have increased impacts on visual aesthetics, surface drainage, wildlife, xeric riparian vegetation, and "waters of the U.S.".

2.2.7.5 Heap Leach Pad South of the Pit

A potential heap leach pad, partially on private land south of the pit, has been eliminated from further consideration. The pad location would be on irrigated farmlands in a flood plain, and the groundwater table is within 50 feet of the surface, making design requirements much more stringent, and perhaps unachievable.

3.0 Description of the Existing Environment

This "Existing Environment" section has been compiled from the existing data base submitted by AZCO to the BLM in its Plan of Operations. Certain environmental information has been abbreviated where possible, allowing for significant issues to be addressed in detail. The Plan of Operations and environmental appendices are available at the BLM Safford District Office for a more detailed review of non-critical issues [AZCO, 1991]. The following appendices were submitted with the Plan of Operations:

- Appendix A - Claim Information.
- Appendix B - Preliminary Permitting Studies (geology, soils, and hydrology); Sergent Hauskins & Beckwith (SH&B), August 1989.
- Appendix C - Air Quality Impact Study; EnecoTech, Inc., May 1990. Also, Air Quality Analysis; EnecoTech, Inc., August 1992.
- Appendix D - Biological Impact Study (plants and wildlife); ACI, January 1990.
- Appendix E - Aesthetic Impact Study (visual and acoustic); Mining & Environmental Consultants, Inc. (M&EC), April 1991.
- Appendix F - Class III Archaeological Survey; SWCA Inc., June 1989.
- Appendix G - The Socioeconomic Impact of the Sanchez Copper Oxide Project, Safford, Arizona; Western Economic Analysis Center, February 1991.
- Appendix H - Geotechnical Investigation Report - Alternate Leach Pad; SH&B, July 1990.
- Appendix I - Sanchez Copper Heap Leach Project; Vector Engineering, Inc., August 1992.
- Appendix J - Hydrogeologic Investigations; Geothermal Surveys, Inc., September 1992.

3.1 Air Resources

The Sanchez Project area is classified as a high desert environment. This region, as such, is typified by warm, dry winters and hot, relatively wet summers. Due to the dry conditions and higher elevation, diurnal temperature ranges can be as great as 50°F. This is especially true during the drier seasons.

3.1.1 Temperature and Precipitation

The climate at the site is semi-arid, with little precipitation and a high evaporation rate. Temperatures range from 7° to 114°F. Table 3-1 gives the average monthly and annual temperatures for Safford. The average annual temperature is 64.1°F. The highest mean monthly temperature occurs in July and is 85.0°F, while the lowest occurs in January, and is 44.2°F.

The mean day of the last spring freeze (32°F) is April 14. The mean day of the first fall freeze is October 27, giving Safford a growing season of 195 days.

Table 3-1
MEAN MONTHLY TEMPERATURE AND PRECIPITATION

	Temperature (^{0}F)	Precipitation (inches)
January	43.7	.63
February	47.5	.55
March	52.9	.56
April	60.5	.10
May	68.8	.12
June	78.5	.24
July	82.9	1.76
August	80.4	1.55
September	74.9	.99
October	64.3	.86
November	51.8	.40
December	44.2	.76
ANNUAL	62.5	8.60

NOTE: Normals taken from period 1951 through 1980
SOURCE: National Oceanic and Atmospheric Administration (NOAA)

The area is subject to occasional flash floods when storms of significant magnitude produce high runoff within a very short duration. The 100-year, 24-hour rainfall for this area is 3.85 inches. [NOAA, 1987]

Table 3-1 also represents the average monthly and annual precipitation for Safford for a thirty-year period from 1951 to 1980. From the table, the average annual precipitation is 8.60 inches with the highest precipitation occurring in the months of July, August and September. The driest months are April, May and June. Although some of the total annual precipitation may occur as snow, most of it falls as rain.

3.1.2 Winds

Wind data for the year 1988 was collected at the University of Arizona Agricultural Station east of Safford and about 8 miles southwest of the mine site. Table 3-2 shows the frequency of winds by

direction and speed; the wind rose derived from this data is shown on Figure 3-1. From the figure, winds from the east through southeast account for over 43% of the total, while winds from the northwest through west-northwest account for an additional 22%. This wind pattern is fairly consistent throughout the year. The annual mean wind speed is a low 6 miles per hour.

Table 3-2
FREQUENCY OF WINDS BY DIRECTION AND SPEED

DATA PERIOD JANUARY THROUGH DECEMBER 1988
TIME (pst): 0000-2400

	------------SPEED CLASS INTERVALS (M/S)------------							
DIRECTION	1<1½	1½<3	3<5	5<8	8<11	>11	ALL	Mean Speed
N	.30	.93	.11	.02	.00	.00	1.37	2.0
NNE	.22	.58	.10	.05	.00	.00	.94	2.2
NE	.35	.72	.14	.06	.00	.00	1.26	2.2
ENE	.46	1.25	.30	.07	.00	.00	2.07	2.2
E	2.41	6.39	1.39	.13	.00	.00	10.31	2.1
ESE	2.55	9.62	4.35	.43	.00	.00	16.95	2.5
SE	1.63	7.31	5.87	1.08	.00	.00	15.89	2.9
SSE	1.34	3.69	2.29	1.14	.02	.00	8.48	3.0
S	.99	1.84	.47	.47	.13	.00	3.89	2.7
SSW	.79	1.34	.20	.23	.01	.00	2.57	2.3
SW	.68	1.08	.13	.14	.01	.00	2.04	2.1
WSW	.67	1.16	.15	.07	.00	.00	2.05	2.0
W	.51	1.98	.54	.17	.02	.01	3.23	2.5
WNW	.51	4.11	2.62	1.39	.46	.02	9.11	3.6
NW	.49	4.52	5.12	2.99	.26	.05	13.43	3.9
NNW	.30	1.70	.96	.24	.00	.00	3.19	2.8
ALL	14.20	48.22	24.73	8.66	.91	.08	96.80	2.8

CALM (less than one meter per second) = 3.2
PERIOD MEAN WIND SPEED = 2.7 M/S
TABLE ENTRIES ARE EXPRESSED IN PERCENTAGES.
TO CONVERT FROM METERS PER SECOND TO MILES PER HOUR, MULTIPLY BY 2.24

SOURCE: ENECOTECH, 1990

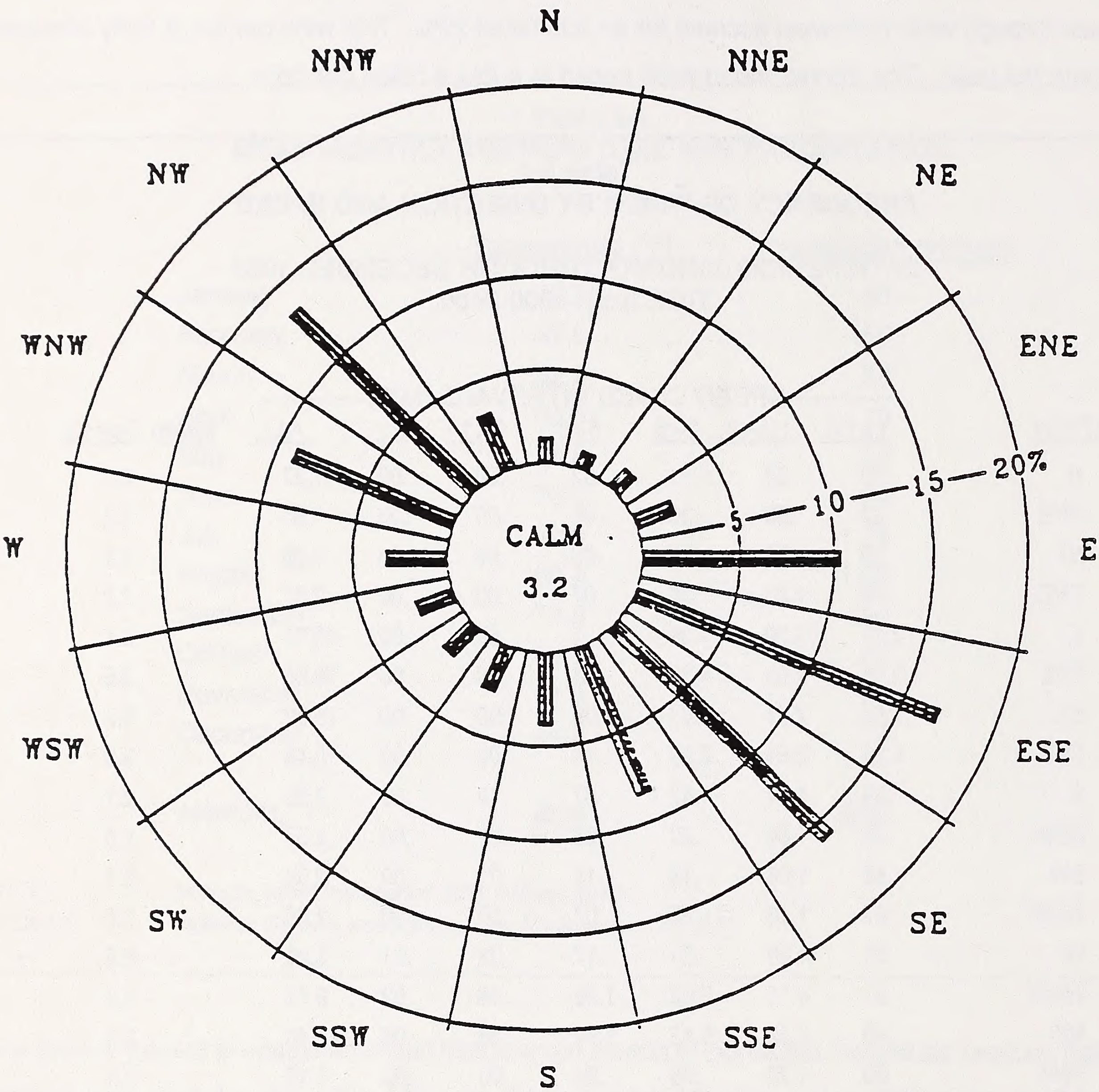


FIGURE 3-1

SANCHEZ COPPER PROJECT
WIND ROSE
FOR SAFFORD, ARIZONA

EnecoTech
Denver, Colorado

1991

3.1.3 Air Quality

The Arizona Department of Environmental Quality (DEQ) has collected ambient particulate data in the town of Safford for several years. However, due to the extensive agricultural land use in and around the town, these data are not representative of existing particulate concentrations at the Sanchez project site (located to the east-northeast). Further, these data were for total suspended particulate and not PM_{10} (particulate matter with an aerodynamic diameter of 10 microns or less). Ambient particulate standards are promulgated only for PM_{10}.

The Arizona DEQ was contacted regarding other particulate monitoring sites which might be more representative of the Sanchez project site. Based on monitoring data collected by the DEQ at sites considered representative of the area around Sanchez, the State estimated the 24-hour and annual concentrations of PM_{10} at 30 and 15 micrograms per cubic meter ($\mu g/m^3$), respectively.

Monitoring for any other pollutants has not been conducted in the general vicinity of the project. However, due to the lack of industrial sources in the area, it can be reasonably assumed that ambient concentrations of regulated pollutants are very low. It is estimated that ambient annual average nitrogen dioxide (NO_2) concentration in the project area should not exceed 10 $\mu g/m^3$, and the one-hour ambient carbon monoxide (CO) concentration should not exceed 1,100 $\mu g/m^3$. The sulfur dioxide (SO_2) background concentrations are estimated to be 20 $\mu g/m^3$ for all averaging periods. [EnecoTech, 1992]

To assess the air quality impacts of the project, the EPA-approved Industrial Source Complex Long-Term 2 (ISCLT2) and Short-Term 2 (ISCST2) dispersion models were used. A revised air quality analysis has been performed by EnecoTech, updating the 1990 air quality analysis. A total of 100 sources were modeled for particulate and 84 sources were modeled for other criteria pollutants. Most of the sources were idealized as area or volume sources, and one source was modeled as a point source. Ambient concentrations were modeled at receptor points located on a grid with 500-meter receptor spacing extending from each side of the property boundary out to between 1,000 and 1,500 meters. In addition, receptors were located along the project property boundary at 200-meter intervals, and at the nearest residences and Class I areas [EnecoTech, 1992]. Model input included meteorological data (summarized earlier) and the emissions data for the proposed equipment (PM_{10}, NO_2, CO, and SO_2). Sources were considered either as volume, area, or point sources as appropriate. Planned mitigation measures, such as road watering and dust control equipment, were taken into account in calculating emissions. All nitric oxide (NO_x) emissions were considered to be entirely NO_2, and chemical and physical changes which occur naturally and tend to reduce the NO_2 concentration were ignored. Thus, NO_2 modeling results are conservative. See Tables 3-3 and 4-2 for these results.

Dust emissions sources located in the open pit were adjusted in the model so that emissions occur only during daytime hours when surface heating allows particulate to be transported from the pit to the surface. All other pollutant emissions from the pit were modeled during all hours of the day.

Table 3-3
SUMMARY OF MAXIMUM AIR POLLUTANT CONCENTRATIONS
($\mu g/m^3$)

Description	Coordinates	PM_{10} Modeled Impact	PM_{10} Impact with Background Added	NO_X Impact	NO_X Impact with Background Added
Maximum Annual (Off-Site)	(6408, 3060)	16	31	23.0	33.0
Maximum Annual (Closest Residence)	(8016, 1056)	2	17	4.0	14.0
Maximum 24-Hour (Off-Site)	(6696, 1824)	114	144	--	--
Maximum 24-Hour (Closest Residence)	(8016, 1056)	58	88	--	--

SOURCE: EnecoTech, 1990

3.2 Geology and Mineral Resources

Three principal stages of geologic development of the Safford Basin are recognized as they pertain to the age and lithology of the geologic units. These three stages can be categorized as:

- mountain block and basement rock emplacement;
- aggradational basin fill; and
- degradational basin erosion and deposition. [Muller, 1973]

Igneous and volcanic basement and mountain range rocks are exposed in the mountains and foothills boarding the Safford Valley. Older basin fill deposits occur along the edges of the valley, between the mountains and the Gila River flood plain. Low elevation, younger alluvial deposits are present along the course of the river and major tributaries.

Mountain blocks and basement rocks were emplaced in the area prior to the structural closure of the Safford Basin [Muller, 1973]. Basin and Range block faulting and basin subsidence began in the late Tertiary (18 to 12 million years ago) and resulted in the formation of a closed basin by the mid-Miocene [Houser and others, 1985].

3.2.1 Geologic Setting

Geologic units encountered within the leach pad site of the Sanchez Copper Project consist of pediment alluvium, older fluvial terrace alluvium and underlying lacustrine sediments. Lacustrine clays, silts, and sands are exposed in the incised drainages of Head Canyon and Big Canyon. The canyon bottoms contain stream channel alluvium ranging from silty sand to sandy gravel with considerable cobbles and boulders. The main leach pad area consists of terrace sediments of fluvial origin. These commonly are caliche-cemented silty to clayey gravels with some to considerable cobbles. A generalized geologic map of the project area is presented in Figure 3-2.

The slightly steeper gradient, north end of the site consists of caliche-cemented silty gravel and cobble alluvium. These lie on a dissected pediment surface composed of semi-lithified and caliche-cemented silt and conglomerate of pebble through boulder size. Talus and hillslope colluvium is present along the north side of the site, overlapping outcrops of volcanic andesite bedrock. The volcanic exposures extend across the steeply sloping flanks of the Gila Mountains north of the leach pad site.

Geologic units at the open pit site consist of stream channel alluvium, older slope colluvium and alluvium, lacustrine sediments, and outcrops of volcanic andesite and igneous intrusions. Tertiary

volcanic andesite and intrusions of quartz monzonite and granodiorite are exposed along the east and north sides of the proposed open pit area. A small exposure of Tertiary volcanic conglomerate and tuff occurs at the head of the unnamed drainage through the open pit. Lacustrine and fluvial beds of the Gila Conglomerate group are exposed along the west side and lower east side of the drainage through the open pit area. These deposits consist of laminated clay, silt and sand with a lower unit of silt and conglomerate. The lower conglomerate is lithified by calcareous cement and the upper clay, silt, and sand beds are partially caliche cemented. Talus and slope debris colluvium at the head of the drainage consist of poorly-sorted cobble and boulder rubble of volcanic lithologies and slightly caliche-cemented silty gravel with angular cobbles and boulders. Drainage basin fill deposits in the open pit area consist of silty gravel alluvium with considerable angular to sub-rounded cobbles and boulders. Some areas of the more fine-grained alluvium are slightly caliche cemented. Much of the lower drainage basin has been disturbed by mining activities. [M&EC, 1991]

3.2.2 Geologic Hazards

Geologic hazards include ground shaking associated with earthquakes and unstable soil. Evidence of seismic activity in the valley includes lineaments visible in quaternary sediments and displacement of quaternary sediments evident at several locations in the Safford Valley. Modern movement along these faults could cause damage due to shaking or soil liquefaction in areas of saturated soils. Thunderstorms can drop significant amounts of precipitation in a very short period of time, resulting in flash flooding of otherwise dry channels. These floods can endanger road crossings or structures that have been built in low lying vulnerable areas. Slight to moderate expanding clays are reportedly present in the lake bed deposits.

The three most common failure modes in an open pit mine are plane shear along single discontinuities, rotational shear, and step path involving two discontinuous structure sets. [Call & Nicolas, Inc., 1989]

- The plane shear failure mode occurs when a geologic structure has a strike within twenty degrees of the strike of the slope face, and a dip flatter than the slope angle. The simple wedge geometry occurs when two structures intersect to form a completely detachable prism which has a plunge that is less than the slope angle.

- Rotational shear failure typically occurs in weaker rocks with low, intact mass strength with random or nonexistent geologic structure. Rotational shear commonly starts at the toe of a slope and progresses upwards to produce an arc- or cone-shaped slide area.

- The step path failure is similar to plane shear as it assumes displacement along structures nearly parallel to the slope. A step path requires a master discontinuity set dipping less than the slope angle, in conjunction with a steeper discontinuity set connecting the various master joints in a continuous fashion. Then the master joint set lengths are short, and steep structure exists within the slope, the step path failure mode is more likely than the continuous plane shear failure mode.

3.2.3 Mineral Resources

At Sanchez, the lower unit Cretaceous andesites were intruded by a column of monzonite porphyry called the "Main Stock," up to 1,300 feet deep by 900 feet in diameter and drilled to a depth of more than 2,500 feet, by "microdiorites" with three associated mineralized breccia pipes and by a weakly mineralized monzonite porphyry "Younger Stock" (Figure 3-3). The intrusion was in a large zone of structural weakness caused by shattering, faulting, shearing and extension of the rocks within a broad intersection of district-wide east-northeasterly, northwesterly, easterly and northerly fault and fracture systems. Primary copper sulfides, mostly chalcopyrite and bornite, together with pyrite, magnetite and minor molybdenite were deposited as small disseminations replacing mafic minerals and as veinlets and specks with or without quartz and minor calcite in veins, faults and fractures of the stock and the andesites, forming a "disseminated," low sulfide, porphyry copper deposit. The copper sulfides and secondary copper minerals derived from them are most abundant (>0.30% copper) in the monzonite porphyry stock and in the andesites near it in a central zone of potassic alteration with abundant secondary biotite. The biotite zone gives way to a chlorite-biotite zone, reported phyllic and argillic zones, surrounded by a propylitic zone containing no porphyry copper mineralization whose outer limits are known to be over 4,000 feet x 8,000 feet.

The Sanchez deposit formed under upper fragmental andesites within thousands of feet of lower unit andesites, which were gradually and sporadically uplifted and eroded over a long time, commencing about 50 million years ago. The orebody was unroofed and eroded, and was subjected to oxidation, leaching and supergene enrichment. The weathering processes ceased about 30 million years ago when Sanchez was buried under Oligocene volcanics and sediments. The ancestral Gila River carved the present terrain in the mine area, eroding the surface of the orebody to its present configuration during the past 2 to 3 million years. Only a small part of the deposit is currently exposed, the remainder being covered by Oligocene basalts, Gila Conglomerate and younger alluvium, talus and soil.

Weathering processes eroded a large part of the deposit and converted much of the remainder to a copper oxide zone 1,000 to 1,500 feet thick, containing chrysocolla, copper pitch and cupriferous

limonite, native copper, minor cuprite and rare malachite, chalcanthite and brochantite overlying a mixed ore zone up to 600 feet thick, averaging 300 feet, which contains chrysocolla and other copper minerals, native copper, supergene chalcocite and covellite, and the primary sulfides chalcopyrite, bornite, sparse pyrite and molybdenite in very minute (0.1 to 0.2%) quantities of total low sulfide material.

The Sanchez orebody, as defined by outcrops and 150 drill holes with nearly 190,000 feet of drilling, is currently known to be more than 2,000 feet in diameter and thickness. The open pit will mine the oxide copper reserves above a cutoff grade of 0.20% copper mineralization from the 3,625- to 3,000-foot elevations to bottom between the 2,000- and 1,900-foot elevations. Using a 0.10% copper cutoff, minable reserves exceed 200,000 tons at an average grade of about 0.30% copper. The outer limits of 0.20% copper mineralization are well defined on the northeast, east, south and west. Drilling in the northwest quadrant of the deposit, north of 16050N, may expand reserves and determine if the "Younger Stock" is waste or low grade leach ore. [Wright Engineers Ltd., 1990]

3.2.4 Seismicity

According to U.S. Geological Survey's Open File Report No. 82-1033, the area of the mine site has only a 10% chance of receiving an earthquake with a horizontal acceleration equivalence of less than 10% of the force of gravity within the next 250 years. The area, therefore, does not appear to be in a seismic impact zone.

3.2.5 Cross-Section Descriptions

Five new cross-sections have been prepared by GSI/water to present the geology and hydrology of the project site. Figure 3-2, Surface Geology, indicates the locations of each new cross-section. A brief description of each cross-section is as follows:

Figure 3-3	Cross-Section A-A′	A northeast-southwest cross-section through the first phase leach pad area.
	Cross-Section B-B′-B″-B‴	A cross-section approximately north to south through the proposed pit area.
Figure 3-4	Cross-Section C-C′	A west-east cross-section of the area south of the proposed pit.
Figure 3-5	Cross-Section D-D′	A north-south cross-section through the center of the waste rock dump.
	Cross-Section E-E′	A northeast-southwest cross-section on the eastern side of the waste rock dump.

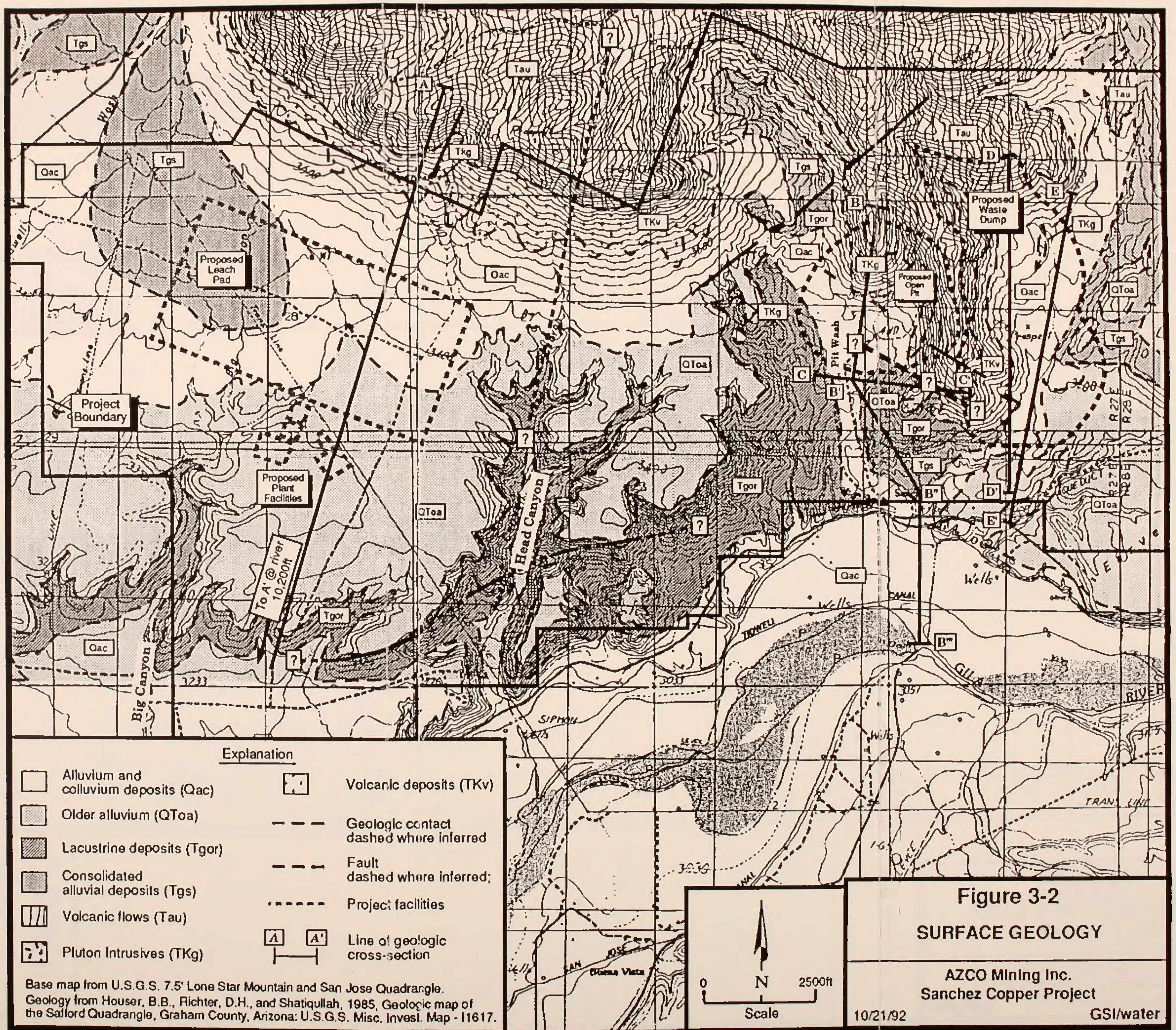


Figure 3-2
SURFACE GEOLOGY

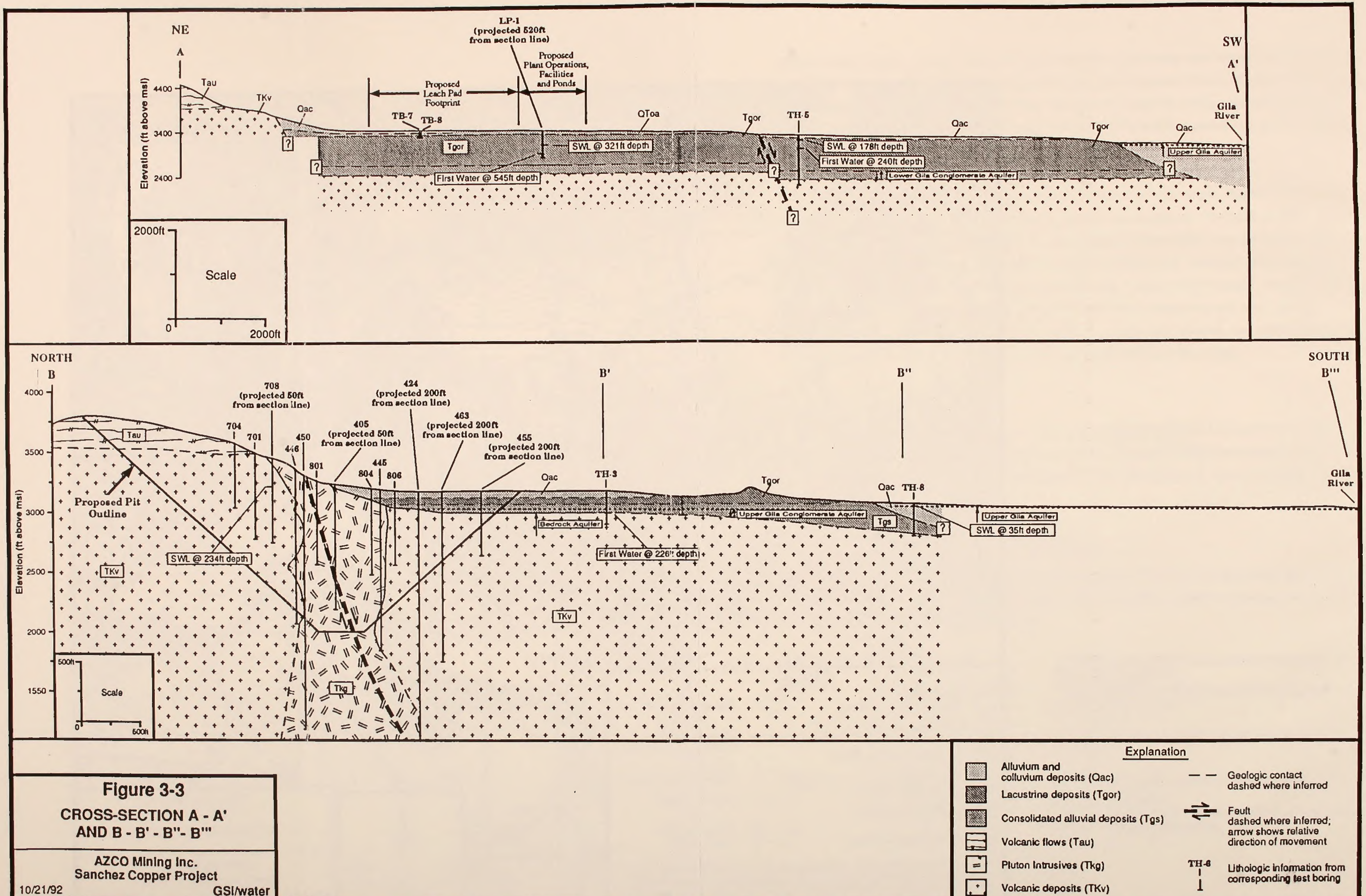


Figure 3-3

CROSS-SECTION A - A' AND B - B' - B''- B'''

AZCO Mining Inc.
Sanchez Copper Project

10/21/92 GSI/water

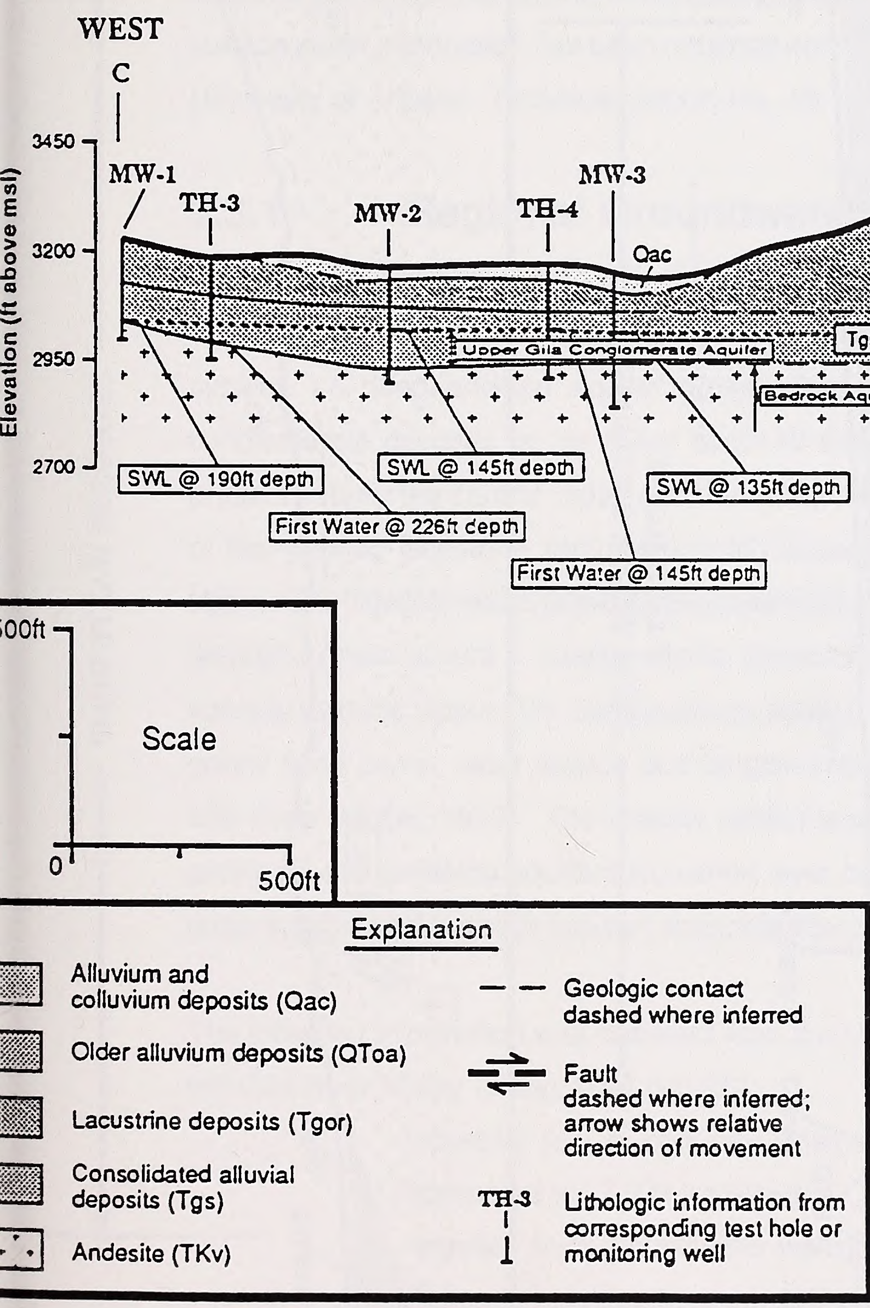
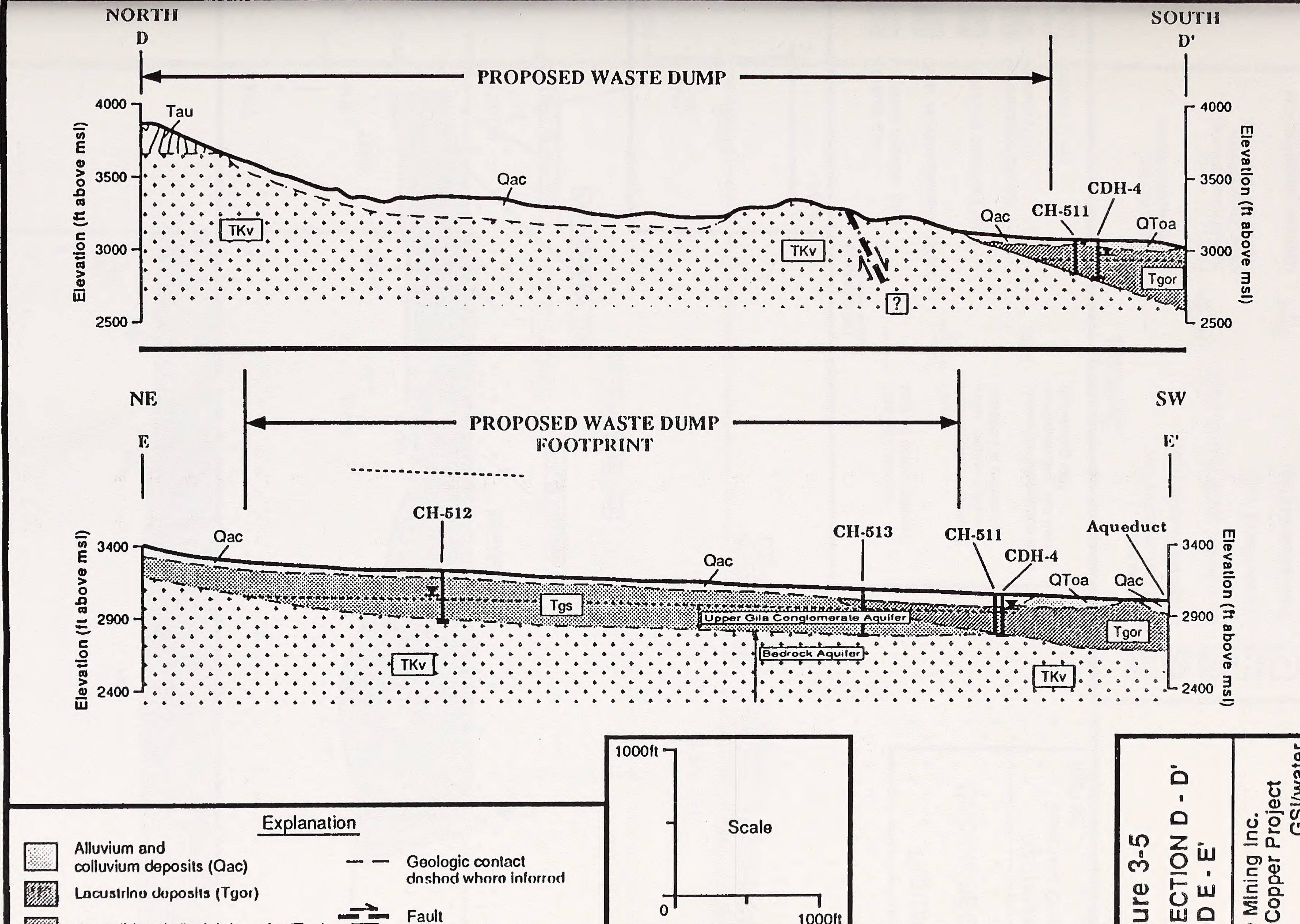


Figure 3-4

CROSS-SECTION C -C'

AZCO Mining Inc.
Sanchez Copper Project

10/21/92 GSI/water



Well	TD (ft)	First water (ft above msl)	Surface elev. (ft above msl)	Projected (ft) D-D'	Projected (ft) E-E'	SWL (date) (ft)
CDH-4	290	2987	3137	100	0	100 (9/92)
CH-511	275	unknown	3133	0	300	unknown
CH-512	345	2996	3236	150	200	167 (9/92)
CH-513	290	unknown	3163	700	200	unknown

Figure 3-5
CROSS-SECTION D - D' AND E - E'

AZCO Mining Inc.
Sanchez Copper Project
10/21/92 GSI/water

3.3 Water Resources

Groundwater resource information has been obtained from the 1992 GSi/water report, submitted as Appendix J of the Mining Plan of Operations, and from the 1989 Sergent, Hauskins & Beckwith report, submitted as Appendix B of the Mining Plan of Operations for Sanchez. Local aquifer nomenclature is based upon regional aquifer descriptions available in the literature (GSi/water, 1992). Additionally, surface water information has been obtained from the GSi/water report (1992), Wright Engineers, 1990; University of Arizona, Technical Report No. 15, 1973; and Sergent, Hauskins & Beckwith, 1989.

3.3.1 Regional Groundwater Conditions

The regional groundwater hydrologic environment of the Safford Basin consists of a multiple aquifer system. A deep artesian aquifer (Lower Gila Conglomerate aquifer) occurs in cemented basal conglomerate deposits of the lower basin fill sediments. The Lower Gila Conglomerate aquifer is present in both the central valley and the valley flanks, and extends from bedrock to an overlying cap of fine-grained lacustrine sediments which separate the Lower Gila Conglomerate aquifer from the Upper Gila Conglomerate aquifer. In areas near the Gila River, a shallow upper aquifer (Upper Gila aquifer) system occurs in coarse alluvial deposits which overlie the lacustrine deposits and connects laterally with the Upper Gila Conglomerate aquifer. The Upper Gila aquifer is present within sand and gravel flood plains, older terrace and fanglomerate deposits, and is hydraulically connected with the Gila River [Muller, 1973]. The shallow aquifer is used for irrigation, and numerous wells in the valley penetrate the confining aquitard lacustrine layer between the two major aquifer units. Additionally, a deep aquifer (the Bedrock aquifer) occurs in the crystalline basement rocks.

The following information was obtained from the USGS Tucson Office regarding groundwater uses in the Gila River Valley during 1990 [M&EC]:

- Industrial use is primarily Phelps Dodge Corporation's operation at Morenci, and accounted for 7,874 acre-feet;
- Irrigation from groundwater wells utilized 119,566 acre-feet;
- Safford's municipal use was 637 acre-feet from groundwater wells serving as a backup for the City's water supply, which is primarily obtained from Bonita Creek.

The basal conglomerate in the Safford area occurs at depths ranging from about 1,450 feet in the central valley to less than 300 feet close to the flanks of the Gila Mountains. Interbeds of fine- to coarse-grained sands and silts commonly occur within the conglomerate facies. In places, the basal

conglomerate merges upward with marginal fanglomerate sediments along the valley sides. Elsewhere, the lacustrine clays separate the units, as in the Sanchez project area. Groundwater in the basal conglomerate is generally under artesian conditions. Wells initially drilled into the artesian aquifer in the 1930s yielded surface flows of warm, saline water [Knechtel, 1938].

Wells currently in use and recent drill holes into the deep artesian aquifer have static water level depths ranging from about 90 feet in the valley center to about 400 feet at the northern margins of the valley. The elevations of the static water levels in the artesian aquifer vary greatly throughout the valley. The water levels depend mainly on the well location within the valley in relation to differences in recharge areas, confining layer depths, and interconnected water-bearing strata in the Upper Gila Conglomerate unit. In the area north and east of Safford, the static water level in wells penetrating the lower aquifer ranges from about 3,031 to 3,079 feet above sea level. These water levels range from 35 feet to 264 feet below the ground surface in the mine area.

Groundwater flow in the lower aquifer is mainly to the west and northwest along the axis of the Gila River basin [Weist, 1971]. The groundwater gradient ranges from about 50 to 100 feet per mile from the mountain flanks to the Gila River. Groundwater within localized zones of interbedded sands in the lacustrine sediments also moves vertically upward and enters the overlying shallow alluvium in limited quantities. The rate of vertical flow from the basin fill to the alluvial sediments is estimated to be about 0.9 acre-feet per acre per year [Weist, 1971].

3.3.2 Local Groundwater Conditions

Most irrigation wells in the Safford Basin tap the Upper Gila aquifer within the Gila River floodplain and within stream channel and terrace deposits along the sides of the valley (Upper Gila Conglomerate aquifer). The floodplain alluvium is recharged by flows in the Gila River and upward flows from the deep basal conglomerate aquifer. The floodplain deposits range from 1.5 to 2 miles wide at Sanchez and Solomon, and are up to about 100 feet thick [Knechtel, 1938]. An estimated average saturated thickness of 40 feet occurs throughout most of the Gila River floodplain [Hanson, 1972].

The water in the Upper Gila aquifer is unconfined and occurs mostly in the coarser sands and gravel lenses of the lower part of the floodplain sediments. Water levels in the floodplain wells commonly range from 10 to 20 feet below the ground surface near the river, and 15 to 50 feet below land surface along the floodplain fringes. Water-bearing beds are commonly encountered at several levels within the deposits. The sand and gravel beds which yield water are nearly horizontal and are commonly

overlain by relatively impermeable layers of silt and clay [Knechtel, 1938]. The sand and gravel lenses are irregular and pinch out laterally.

Well yields from the floodplain alluvium range from about 20 to 800 gallons per minute, as indicated by the data included in Table 3-4. The locations of the wells listed in Table 3-4 are shown on Figure 3-6. Groundwater flow is from the flood plain edges to the basin center and downstream along the Gila River channel. The flood plain groundwater has been the main source of irrigation since settlement of Safford Valley. Recharge to the aquifer is through infiltration from the Gila River, major stream channels, and deep irrigation [Muller, 1973].

A limited amount of information on groundwater quality is available from wells tapping the lower gravel aquifer. Wells known to penetrate this aquifer range from about 430 to 1,400 feet deep and are located on alluvial terraces west and south of the leach pad site. Water quality data for these wells are listed in Table 3-5. The total dissolved solids range from 2,045 to 5,098 parts per million (ppm). [Sergent, Hauskins & Beckwith, 1989].

All groundwater sampled from the deep aquifer wells had high concentrations of sodium (651 to 1,691 ppm), chloride (234 to 2,128 ppm), calcium (22 to 212 ppm), sulfate (220 to 2,880 ppm), and fluoride (1.8 to 3.5 ppm). The artesian water tends to be warm, with recorded temperatures of up to 41^{0}C (106^{0}F). The artesian waters of the lower aquifer are as much as ten times more saline than the upper alluvial aquifer [Muller, 1973]. Water classification based on the salt and sodium content [Muller, 1973] indicates that the lower artesian aquifer water is of marginal to poor quality for irrigation purposes.

Stream channel alluvium in major tributaries of the Gila River is hydrologically connected with the floodplain alluvium. Channel alluvium extends for several miles up incised canyons cut into the older alluvial terraces in the Safford area. Major areas of channel alluvium also include San Simon Wash, San Jose Wash, and Bonita Creek. Major channels range from a few hundred to a few thousand feet wide and typically have alluvial deposits less than 40 feet thick. Some irrigation wells and water supply collection galleries tap the aquifer within the stream channel deposits.

Terraces composed of older alluvium of the ancestral Gila River (Upper Gila Conglomerate aquifer) contain some water in perched zones associated with interfingered silt, sand and gravel lenses. A few wells along the flanks of the Gila Mountains yield water at depths of generally less than 100 feet. Some of the water is under small artesian heads, but most of the water-yielding layers are unconfined [Weist, 1971].

Lacustrine basin fill deposits do not generally contain major groundwater aquifers tapped by wells in the Safford Basin. Wells which penetrated the lacustrine silts and clays encountered thin lenses of silt and sand at varying depths which yielded some artesian water. The fine-grained sediments yield only a few gallons per minute of water to wells. Hydraulic tests of the basin fill deposits west of Safford indicate storage coefficients of 0.0043 to 0.005 and transmissivities of 110 to 37.5 gallons per day (gpd) per foot [Weist, 1971; Hanson, 1972]. The average horizontal hydraulic conductivity of the basin fill deposits is estimated at about 0.11 gpd per square foot [Hanson, 1972], or about 1.5×10^{-8} cm/sec.

Table 3-4

Information on Wells in the Vicinity of the Sanchez Copper Project

Well No.	Legal Description	Depth to Water Below Land Surface (feet)	Water Level* Elevation (feet)	Date Measured	Total Depth of Well (feet)	Year Drilled	Yield or Capacity (gpm)
1	D(6-27)13CBC	49	3751	1975	----	1975	----
2	D(6-27)13CC	DRY	----	n.d.	200	1982	----
3	D(6-27)16CCA	59	3761	n.d.	250	----	----
4	D(6-27)17CDB	DRY	----	n.d.	----	1986	----
5	D(6-27)17CDB	----	----	n.d.	----	1984	----
6	D(6-27)19ACB	394	3056	n.d.	433	1959	----
7	D(6-27)19CBC	331	3069	1959	615	1959	----
8	D(6-27)30AAC	353	3037	n.d.	542	1959	----
9	D(6-27)30CDD	237	3083	n.d.	1074	1960	----
10	D(6-27)31DCC	133	3067	n.d.	1400	1961	----
11	D(6-27)34DC	35	3000	1960		1960	35
12	D(6-27)34DCD	12	3028	n.d.	85	1952	----
13	D(6-27)34DDD	45	2988	1960	120	1977	200
14	D(6-27)35ACD	35	3025	n.d.	300	----	650
15	D(6-27)35CCD	35	3000	1978	200	1978	600
16	D(6-27)35DBA	15	3035	n.d.	325	----	1050
17	D(6-27)35DCC	10	3020	n.d.	100	----	600
18	D(6-27)35DDC	20	3030	1952	700	1952	1000
19	D(6-27)35DDD	50	3020	1952	300	1943	----
20	D(6-27)36BBC	200/40	2900/3060	1972/1989	400	1972	----
21	D(6-27)36BBD	DRY	----	n.d.	----	1972	250
22	D(6-27)36BBD	37	3033	n.d.	180	----	200
23	D(6-27)36BCD	18	3042	n.d.	300	----	1000
24	D(6-27)36BCD	20	3040	n.d.	315	----	1200
25	D(6-27)36BDD	25	3055	n.d.	270	----	1350

* Estimated from ground surface elevation at approximate well location.
\- No data.
n.d. No date recorded.

Table 3-4 (Continued)

Information on Wells in the

Vicinity of the Sanchez Copper Project

Well No.	Legal Description	Depth to Water Below Land Surface (feet)	Water Level* Elevation (feet)	Date Measured	Total Depth of Well (feet)	Year Drilled	Yield or Capacity (gpm)
26	D(6-27)36CAD	12	3038	n.d.	150	----	1000
27	D(6-27)36CBD	12	3028	n.d.	100	----	650
28	D(6-27)36CCC	50	3001	1944	300	1944	----
29	D(6-27)36CCC	50	3000	n.d.	300	1943	----
30	D(6-27)36DBD	16	3034	1951	280	1951	1200
31	D(6-27)36DBD	14	3036	n.d.	260	1951	1000
32	D(6-27)36DBD	15	3035	n.d.	260	1050	1400
33	D(6-27)36DDA	16	3034	1947	256	1947	1600
34	D(6-28)31CBC	20	3150	1979	240	1979	20
35	D(6-28)31DAB	20	3023	1973	120	1973	20
36	D(6-28)31DAB	20	3040	n.d.	101	1969	30
37	D(6-28)31DAB	42	3018	n.d.	385	1948	950
38	D(6-28)31DAB	20	3040	n.d.	200	1951	500
39	D(6-28)31DBA	81	2979	1957	400	1957	1000
40	D(6-28)31DBB	21	3039	n.d.	200	1973	800
41	D(6-28)31DBB	20	3040	n.d.	200	1973	800
42	D(6-28)31DCB	20	3050	n.d.	40	1928	7
43	D(6-28)31DCB	15	3055	n.d.	60	1951	----
44	D(6-28)31DCB	20	3050	n.d.	200	1954	7
45	D(7-27)02BAB	40	2970	1955	125	1955	500
46	D(7-27)02BBA	9	3021	n.d.	80	1953	----
47	D(7-27)03ACB	51	2949	1952	72	1952	300
48	D(7-27)03BBC	44	3056	1950	77	1950	700
49	D(7-27)03BDB	32	2999	n.d.	58	1940	800
50	D(7-27)03BDB	42	3001	1944	70	1946	1000

* Estimated from ground surface elevation at approximate well location.
\- No data.
n.d. No date recorded.

Table 3-4 (Continued)

Information on Wells in the

Vicinity of the Sanchez Copper Project

Well No.	Legal Description	Depth to Water Below Land Surface (feet)	Water Level* Elevation (feet)	Date Measured	Total Depth of Well (feet)	Year Drilled	Yield or Capacity (gpm)
51	D(7-27)03CAD	22	3002	1952	53	1962	150
52	D(7-27)03CBB	44	2976	n.d.	75	1939	15
53	D(7-27)04AAA	25	3195	n.d.	80	1963	350
54	D(7-27)04DAD	25	3015	1951	80	1951	250
55	D(7-27)04DAD	20	3010	n.d.	70	1953	250
56	D(7-27)04DAD	20	3010	n.d.	65	1936	900
57	D(7-27)04DDA	20	2090	n.d.	60	1936	500
58	D(7-27)04DDA	20	2980	1976	55	1976	2400
59	D(7-27)04DDD	35	2975	n.d.	620	1953	500
60	D(7-27)05AAA	184	3046	1961	1276	1961	10
61	D(7-27)07CC	15	2945	1957	68	1957	1000
62	D(7-27)07DC	15	2955	n.d.	85	1945	1200
63	D(7-27)07DC	14	2956	n.d.	64	1944	1000
64	D(7-27)07DD	--	----	n.d.	74	1946	1500
65	D(7-27)07DD	15	2955	n.d.	68	1939	1000
66	D(7-27)08AD	24	2966	n.d.	64	1945	650
67	D(7-27)08AD	24	2966	n.d.	64	1942	500
68	D(7-27)08ADD	13	2977	1981	62	1981	650
69	D(7-27)08DA	24	2966	n.d.	64	1980	850
70	D(7-27)08DB	24	2966	n.d.	65	1942	1750
71	D(7-27)09AAA	30	2960	1963	70	1963	400
72	D(7-27)09ABA	20	2970	n.d.	70	1961	620
73	D(7-27)09ABB	18	2982	n.d.	79	1960	650
74	D(7-27)09BAC	20	2980	n.d.	60	1939	300
75	D(7-27)09BDB	20	2970	1962	65	1962	400

* Estimated from ground surface elevation at approximate well location.
\- No data.
n.d. No date recorded.

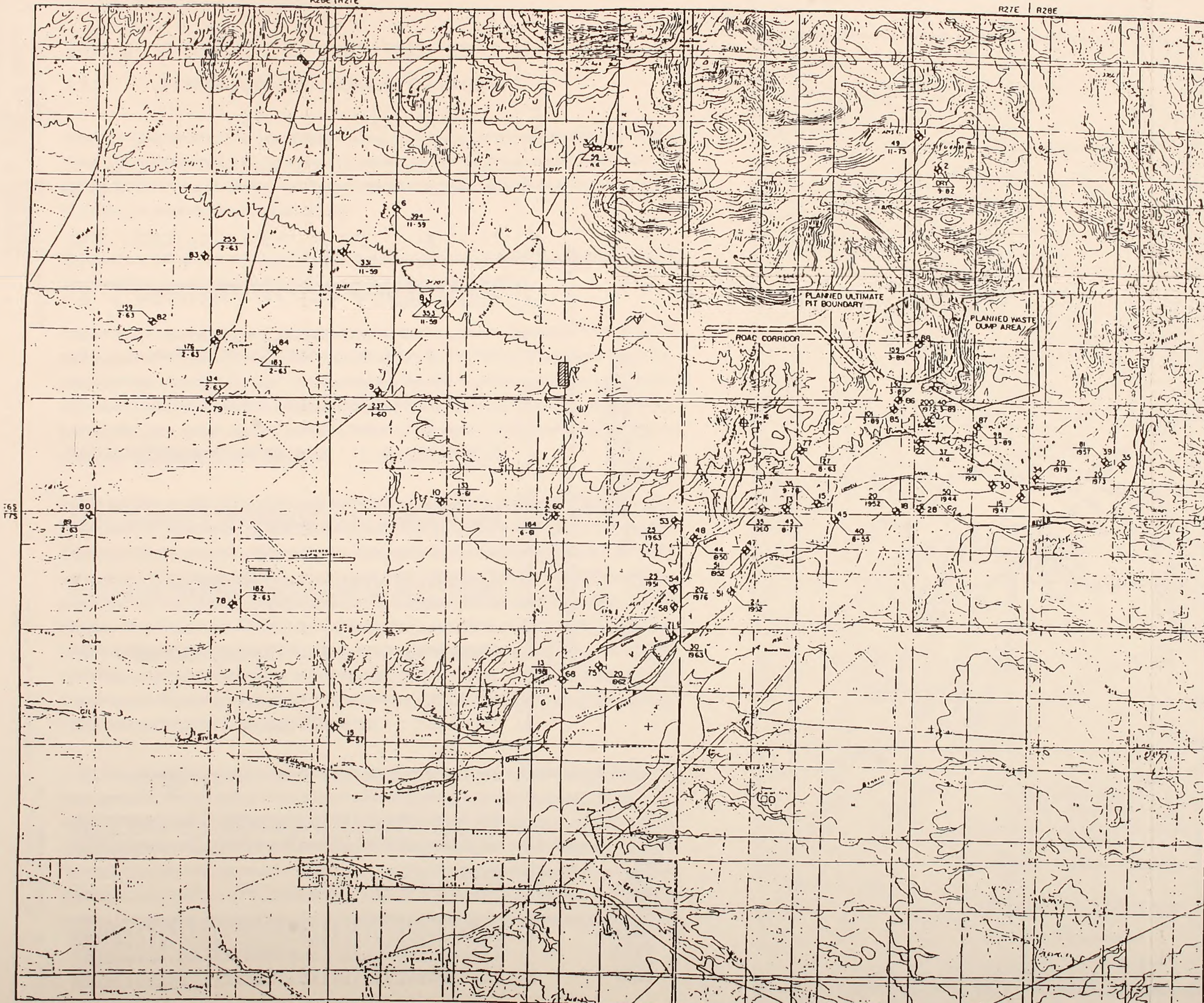
Table 3-4 (Continued)

Information on Wells in the

Vicinity of the Sanchez Copper Project

Well No.	Legal Description	Depth to Water Below Land Surface (feet)	Water Level* Elevation (feet)	Date Measured	Total Depth of Well (feet)	Year Drilled	Yield or Capacity (gpm)
76	D(7-27)09BDC	20	2970	n.d.	60	1962	350
77	D(6-27)35BCC	127	3049	1963	1000	1960	----
78	D(7-26)01CCA	182	2962	1963	2207	1959	----
79	D(6-26)35AAA	134	3062	1963	1185	1959	----
80	D(7-26)3AAA	89	3055	1963	1985	1959	----
81	D(6-26)25BCC	176	3057	1963	1000	1959	----
82	D(6-26)26ACB	159	3051	1963	950	1959	----
83	D(6-26)23DAD	255	3063	1963	587	1959	----
84	D(6-26)25DBB	183	3056	1963	1022	1959	----
85	D(6-27)35AAB	101	3039	1989	----	----	----
86	D(6-27)35AAB	130	3010	1989	----	----	----
87	D(6-27)36ABC	98	3032	1989	----	----	----
88	D(6-27)25BCC	159	3172	1989	----	----	----

* Estimated from ground surface elevation at approximate well location.
\- No data.
n.d. No date recorded.



Depth to Groundwater from Selected Wells and Boreholes, Locations of Proposed Production Wells, and Locations of Soil Sample Test Pits

EXPLANATION

- Well Number, referenced to Table 1
- Depth to groundwater below land surface
- Date of measurement (month & year or year)
- n.d. no date for depth measurement

Contour Intervals 40 (north 1/2 of map) and 20 (south 1/2 of map)

Source: Sergent, Hauskins & Beckwith map titled "Preliminary Permitting Studies Sanchez Copper Project, Safford, Arizona", 4/1989

SANCHEZ COPPER PROJECT

Figure 3-6
LOCATION OF REGISTERED WELLS

TRC

1

Preliminary Permitting Studies
Sanchez Copper Project
Near Safford Arizona
SHB Job No. E89-54

Table 3-5
Summary of Water Quality Data From Selected Wells

(Concentrations of Constituents are in milligrams/liter, except as noted)

Well Location	Well Depth (Feet)	Date Sampled	Calcium	Magnesium	Sodium + Potassium	Chloride	Bicarbonate	Sulfate	Fluoride	Nitrate	T.D.S.	EC at 25 C	pH	Temperature C	Hardness as CaCO
D(6-26)23dad	587	2-1-60	58	5	1081	1152	185	700	--	--	3234	--	7.8	--	144
D(6-26)25bcc	1000	1-27-60	26	5	800	286	168	1150	--	--	2563	--	8.0	--	64
D(6-26)25dbb	1022	12-21-59	22	3	683	308	217	900	--	--	2183	--	8.0	--	56
D(6-26)26acb	950	1-16-60	135	34	1399	234	146	2880	--	--	4857	--	8.2	--	338
D(6-27)16cb	50	2-17-41	112	24	36	12	375	123	1.3	0.2	494	77	--	--	378
D(6-27)16cbd	290	2-20-63	--	--	--	180	--	--	--	--	1130	--	7.2	--	--
D(6-27)16cca	--	1982	180	46	72	130	323	250	0.2	130	--	1700	6.9	23	--
D(6-27)19abc	433	11-12-59	212	34	1560	2128	176	860	3.5	--	5031	--	7.1	--	530
D(6-27)19cbc	615	12-1-59	192	7	1651	2166	168	850	1.8	--	5098	--	7.8	--	508
D(6-27)30aac	542	11-20-59	53	7	656	822	232	220	2.5	--	2045	--	7.7	41.1	132
D(6-27)30cdd	1074	1-05-60	26	6	651	350	217	820	--	--	2085	--	7.7	36.1	64
D(6-27)31dcc	1400	1-21-63	--	--	--	835	--	--	--	--	2530	--	8.1	36.1	--
D(6-27)34dcc	--	7-1972	118	37	327	410	415	200	2.5	34.5	1544	240	7.4	--	--
D(6-27)35ac	52	7-15-40	--	--	--	200	287	--	--	--	864	120	--	--	142
D(6-27)35ad	14	5-23-40	50	15	253	232	271	--	--	--	--	152	--	--	152
D(6-27)35bcc	1000	1-21-63	--	--	--	555	--	--	--	--	1865	--	8.8	--	--
D(6-27)35dd	--	9-9-41	78	22	208	248	317	113	2.9	1.0	829	138	--	--	285
D(6-27)35ddd	--	7-1972	4	0.5	237	228	200	120	7.0	6.0	814	143	8.7	--	--
D(6-27)36ccc	--	7-1972	5.6	0.5	320	246	254	105	2.9	20.3	956	151	7.6	--	--
D(6-28)31aa	57	7-29-41	58	15	98	118	247	44	1.3	0.8	457	83	--	--	206
D(6-28)31ada	--	7-1972	100	21	193	372	210	80	1.3	7.5	985	165	8.6	--	--
D(6-28)31ccb	--	7-1972	118	29	155	242	298	120	1.2	22.5	984	145	7.8	--	--
D(6-28)31dac	--	7-1972	70	18	167	252	237	70	1.3	--	817	130	7.6	--	--
D(6-28)31dba	48	7-30-86	47	11	103	110	--	61	1.6	--	480	950	7.5	19.5	160
D(6-28)31dba	--	7-1972	31	9	200	214	224	100	1.9	6.0	785	125	8.6	--	--
D(6-28)31dbd	--	7-1972	74	16	144	212	232	75	1.3	9.0	763	120	7.8	--	--
D(7-26)04baa	--	7-29-86	140	8	2816	3000	--	1700	7.6	--	7700	12,500	8.0	59.0	380
D(7-26)12dc	--	9-10-41	110	29	229	328	344	133	1.6	5.0	1005	174	--	--	394
D(7-26)12dd	14	5-21-40	48	32	254	342	127	209	--	--	948	160	--	--	251
D(7-27)04daa	--	7-1972	101	23	217	246	337	120	1.8	18	1064	168	7.6	--	--
D(7-27)07ddd	--	7-1972	106	24	203	270	366	250	1.9	24.8	1246	200	7.6	--	--
D(7-27)08add	--	7-1972	109	29	205	344	366	190	2.1	36	1281	205	7.6	--	--
D(7-27)08dbb	--	7-1972	124	29	280	370	366	290	2.1	--	1371	220	7.6	--	--
D(7-27)09abb	--	7-1972	114	27	235	332	356	160	1.6	21.8	1248	180	7.5	--	--
D(7-27)4ad	81	6-20-40	--	--	--	270	335	--	--	--	--	151	--	--	232
D(7-27)5aaa	1275	2-19-63	--	--	--	575	--	--	--	--	1670	--	8.3	--	--
D(7-27)7dd	21	2-27-42	--	--	--	700	278	--	--	--	--	335	--	--	248
D(7-27)7dd	--	6-20-40	--	--	--	240	392	--	--	--	--	128	--	--	120
D(7-27)8ba	--	7-30-41	98	28	257	322	359	152	1.8	9.9	1046	160	--	--	360
D(7-27)9da	81	6-20-40	--	--	--	240	278	--	--	--	--	151	--	--	248

Notes: a. Electrical conductivity = K X 10 at 25 C
b. Specific conductivity in microsiemens per centimeter at 25 C
c. Analysis for 1959, 1960 & 1972 samples are sodium only

Reference: U.S.G.S. (unpub.) for 1959, 1960 data
Hem (1950) for 1940-1941 data
Wilson and Garrett (1988) for 1986 data
Muller (1973) for 1972 data
Hassemer and others (1983) for 1982 data

3.3.3 Project Area Groundwater Conditions

A series of water-bearing units were identified during 1992 drilling operations within the project area. These included the Upper Gila Conglomerate Aquifer, Lower Gila Conglomerate Aquifer and the crystalline Bedrock Aquifer. Additionally, the unconfined Upper Gila Aquifer is present adjacent to the Gila River, just south of the proposed mine pit.

The results of drilling from Test Hole 5 have indicated an extensive series of lacustrine clay deposits from a depth of approximately 55 feet to a depth of approximately 810 feet.

A basal conglomerate was encountered underlying the lakebed deposits. The conglomerate extended from a depth of approximately 810 feet to the bedrock contact at 1,035 feet. Significant groundwater production was evident in this basal conglomerate and appears to correspond to the "Deep aquifer" described by Sergent, Hauskins & Beckwith. Cross-sections presented as Figures 3-3, 3-4 and 3-5 all indicate the "Deep aquifer" as the Lower Gila Conglomerate aquifer. All measurements are from top of casing, 21 inches above ground surface.

Drilling activities for well LP-1 near the proposed leach pad penetrated approximately 80 feet of semi-consolidated to consolidated, poorly graded gravels and sands before entering a stacked clay sequence. The clay sequence consists of at least 530 feet of lean and fat clays interspersed with minor sand lenses. Groundwater was encountered in the clays at 545 feet below ground surface (bgs) as a semi-confined unit. This occurrence of groundwater may represent a perched water-bearing unit as it appears to be sourced in a sand/silt lens within the clay layers. Initial production from this unit was approximately 10 gpm, however this flow rate was not sustainable [verbal communication, GSi/water, 1992]. Neither the Upper Gila Conglomerate aquifer, or crystalline bedrock aquifer were encountered in this well to a total depth of approximately 610 feet. A cross-section of the leach pad area (Cross-Section A-A') is included as Figure 3-3.

A series of five (5) wells and a variety of core holes were utilized to characterize the subsurface hydrogeology of the proposed pit area and surrounding Upper Gila aquifer. In general, the proposed pit area is comprised of andesitic bedrock with intrusives of quartz monzonite and overlying deposits of conglomerate, silts and clays and a shallow layer of colluvium and alluvium [GSi/water, 1992]. Hydrogeologic units that are present include the Upper Gila Conglomerate aquifer and the crystalline Bedrock aquifer. The Upper Gila Conglomerate aquifer is only present at the southern portion of the proposed pit area as it wedges out towards the north. Groundwater was encountered in the Upper Gila

Conglomerate aquifer at 150 feet bgs and is unconfined. Groundwater in the Bedrock aquifer is confined and rises to approximately 135 feet bgs [SHB, 1992]. Groundwater in the Upper Gila aquifer is under unconfined conditions at approximately 35 feet bgs [GSi/water, 1992]. Cross-sections of the proposed pit area (Cross-Sections B-B'-B''-B''' and C-C') are included as Figures 3-3 and 3-4.

Aquifer pumping tests were conducted by GSi/water on June 6 through June 16, 1992 on a variety of wells and core holes located within and in the vicinity of the proposed pit area. A total of five (5) wells and three (3) core holes were tested during the field program. Usable data were retrieved from four (4) of the well tests and one (1) of the corehole tests. Results of the pumping tests are tabulated in Table 3-6.

Table 3-6

SITE PUMPING TEST RESULTS

Well	Total Depth (feet)	Approx Elev. (feet)	Water Level (feet below ground surface)	Static Water Level Elev. (feet)	Casing Diameter (inches)	Q	T(pump) (gallons per day per foot)	T(rec) (gallons per day per foot)	Max. SC
MW-1	230.2	3225	189	3036	6	19	910	460	0.86
MW-2	270.8	3185	147	3038	6	260	19600	22000	4.19
MW-3*	302	3166	135	3031	4	42	5500	300	1.47
WELL 20	165	3078	35	3043	16	252	5800	3100	1.78
SW-6	77	3017	67	3040	16	10	na	440	1.67
CH708	293	3343	264	3079	na	<1.84	na	na	0.02

Source: GSi/water, 1992

Q = Discharge, expressed in gallons per minute
T(pump) = Transmissivity Pump Test
T(rec) = Transmissivity Recovery
SC = Specific Capacity, expressed in gallons per minute per foot
* = Data questionable; aquifer not stressed enough
na = Not available

Wells MW-1 and MW-3 are completed within the crystalline Bedrock aquifer. Differences in calculated transmissivity values have been attributed to the probable completion of well MW-3 within a fracture zone, therefore yielding a greater transmissivity value than the unfractured bedrock aquifer [GSi/water, 1992].

Well MW-2 is completed both within the Upper Gila Conglomerate aquifer and the underlying crystalline Bedrock aquifer. The higher transmissivity values recorded in well MW-2 likely reflect the conductive nature of the alluvial sediments. A notable decrease in well production after approximately 90 minutes of pumping was interpreted to reflect the limited areal extent of the Upper Gila Conglomerate aquifer in this area [GSi/water, 1992]. The surface geologic map (see Figure 3-2) indicates the wedging out of alluvial materials in this area.

Well 20 and Well SW-6 are both completed within alluvial sediments bordering the Gila River. Resultant transmissivities are believed to be representative of conditions within the Upper Gila aquifer, with SW-6 values being somewhat low due to poor well or pump efficiencies [GSi/water, 1992].

Core holes located within the proposed waste dump area penetrated approximately 190 to 277 feet of alluvium, conglomerate, silts and clays (Upper Gila Conglomerate aquifer). Crystalline bedrock is found below this [Inspiration Consolidated, 1972]. Groundwater is present in the alluvial sediments at approximately 100 feet bgs and in the Bedrock aquifer at approximately 167 feet bgs [GSi/water, 1992]. The alluvial and bedrock water-bearing units appear to be under unconfined and confined conditions, respectively in this area. Cross-sections of the proposed waste dump area (Cross-Sections D-D′ and E-E′) are included as Figure 3-5.

Aquifer tests conducted west of Safford give an approximation of expected conditions in the floodplain alluvium along the south side of the project site. Average transmissivities of the lenticular gravel, sand and silt sediments ranged from 80,250 to 210,000 gallons per day (gpd) per foot. [Weist, 1971; Hanson, 1972]. Storage coefficients ranged from 0.12 to 0.15, and the average horizontal hydraulic conductivity was 5,200 gpd per foot, or about 7×10^{-4} cm/sec. Some recharge to the floodplain alluvium appears to come from localized sand zones in the underlying fine-grained (lacustrine) basin fill deposits, at an average vertical upward flow of about 1.5 feet per year per square foot [Hanson, 1972]. Estimated average downvalley flow through the upper alluvium is 5.1 acre-feet per day [Hanson, 1972].

At the south edge of the pit, the alluvium is underlain by about 130 feet of clay and silt-cemented conglomerate that pinches out just south of the center of the pit. The lower portion of this conglomerate contains water and has moderate to high transmissivity, based upon results of pumping

tests conducted during June 1992 [GSi/water, 1992]. In the center of the channel, at the south edge of the pit, a maximum vertical distance of 85 feet of the conglomerate is saturated. The conglomerate pinches out to the north and at the channel edges (east and west).

The conglomerate is underlain by bedrock, primarily Tertiary andesitic volcanics and monzonite. This unit is known to be a poor, unreliable source of water in the area. Adits, a shaft, and drifts at the mine site which have been excavated into the bedrock are dry. Except for highly localized zones of fracturing, this unit has extremely low transmissivity, as is documented by June 1992 aquifer pumping tests [GSi/water, 1992]. Seepage from bedrock into the pit should not be significant and will have minimal impacts on the regional groundwater system.

The terraces are covered by a thin layer of caliche and alkaline sand and gravel underlain by a series of impermeable lake bed clays in the pad area. Well LP-1, drilled just south of the proposed leach pad area and adjacent to the proposed pond areas, penetrated approximately 80 feet of semi-consolidated to consolidated poorly graded gravels and sands before entering a stacked clay sequence. The clay sequence consists of at least 530 feet of lean and fat clays interspersed with minor sand lenses. Groundwater was not encountered until approximately 545 feet below ground surface (bgs). More than 75 drill holes and trenches have been completed in the proposed pad and facilities sites. All but one of the drill holes in the pad area terminated in lacustrine clay (the exception bottomed in clay-cemented colluvium). Surface exposures, exposures in drainages, trenches and drill holes indicate the lake beds overlie bedrock and continue north of the north edge of the heap. Beneath an alluvial cover, the pond sites are underlain by greater than 400 feet of a relatively impermeable clay.

GSi/water [1992] calculated the estimated groundwater recharge due to surface water infiltration for each of three catchment recharge areas. Recharge calculations are based on the acreage of each catchment area and the average annual precipitation of the area. A range of 0.5% to 1.0% infiltration was utilized to estimate the actual recharge to the groundwater. Results are tabulated in Table 3-7 for three catchment recharge segments between the Gila Mountains and the Gila River.

Table 3-7

GROUNDWATER RECHARGE

Catchment Recharge Area	Area (acres)	Average Precip. (inches/year)	Average Precip. (feet/year)	Recharge (acre-feet/year) 0.5%	Recharge (acre-feet/year) 1.0%
Sub-Area I (Leach Pad Vicinity)	5440	9.73	0.81	22	44
Sub-Area II (Open Pit Vicinity)	1760	9.73	0.81	7	14
Sub-Area III (Waste Rock Dump Vicinity)	1590	9.73	0.81	6	13
Total	8790	9.73	0.81	36	71

Source: GSi/water, 1992

Recharge to the catchment areas of the project area ranges from six (6) to 44 acre-feet/year, depending upon the percentage of infiltration assumed. Total groundwater recharge within the project area was calculated as ranging from 36 to 71 acre-feet/year, which corresponds to a total available groundwater production of 22 to 44 gallons per minute [GSi/water, 1992].

Groundwater samples were collected from wells and core holes within, and downgradient, from the project area during the summer of 1992 (Figure 3-7). Additionally, available groundwater quality data from USGS monitoring wells located near the project area were collected. Analytical results are found in Table 3-9.

In general, the baseline water quality does not vary greatly between project area water-bearing units. The alkalinity, calcium, chloride, nitrates, and hardness are somewhat higher concentration while sulfates and magnesium are generally lower in concentration in the shallow aquifers. Both arsenic and chromium were identified in select groundwater samples collected from wells bordering the Gila River. Only two samples from the immediate project area recorded detectable concentrations of metals; 0.06 mg/l silver in the sample from corehole CH-425 and 0.005 mg/l arsenic in the sample from LP-1. As indicated by the data in Table 3-8, few project area wells have shown elevated levels of trace elements, and none exceed State Water Quality Standards.

Table 3-8
SUMMARY OF TRACE ELEMENT CONSTITUENTS FROM GROUNDWATER IN SELECTED PROJECT AREA WELLS

Constituent (micrograms per liter)	MW-1	MW-2	MW-3	LP-1	#20-1	State Water Quality Standards Micrograms per liter
Silver-Ag	<0.02	<0.02	<0.02	<0.005	<0.02	5.0
Arsenic-As	<0.005	<0.005	<0.005	0.005	0.05	5.0
Barium-Ba	<5.0	<5.0	<5.0	<0.01	<5.0	100
Chromium-Cr	<0.02	<0.02	<0.02	<0.01	<0.02	5.0
Copper-Cu	<0.05	<0.05	<0.05	<0.05	<0.02	
Iron-Fe	1.5	<0.2	<0.2	<0.20	<0.05	
Magnesium-Mn	<0.10	<0.10	<0.10	<0.10	0.82	
Molybdenum-Mo	<0.10	<0.10	<0.10	<0.10	<0.10	
Lead-Pb	<0.05	<0.05	<0.05	<0.01	<0.05	.2
Selenium-Se	<0.10	<0.10	<0.10	<0.10	<0.10	1.0
Zinc-Zn	<0.05	<0.05	0.09	<0.05	<0.05	

SOURCE: GSi/water, 1992

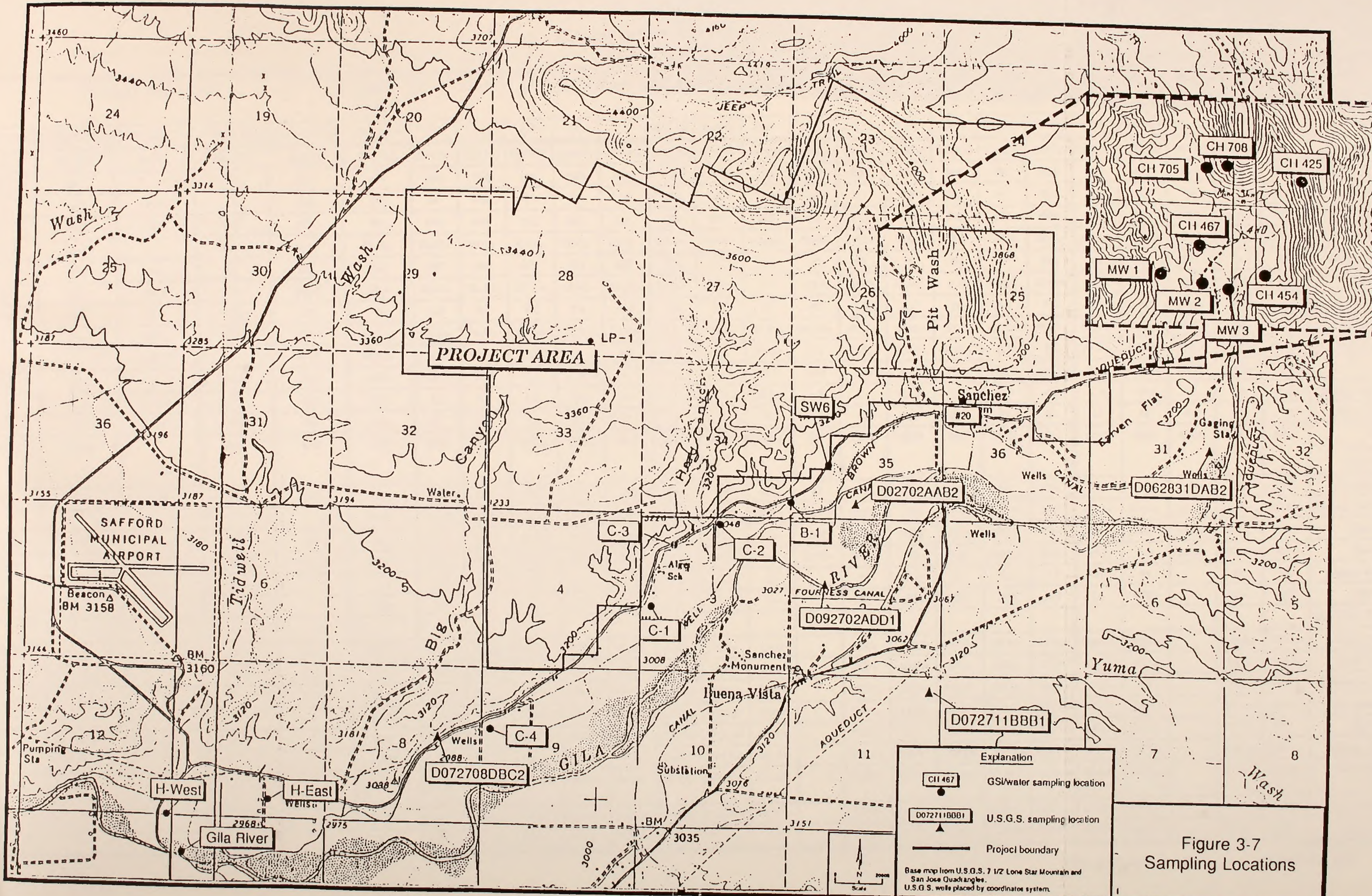


Figure 3-7
Sampling Locations

Table 3-9

GROUNDWATER SAMPLING RESULTS

GENERAL MINERALS	Composite Bedrock[1]				Bedrock Aquifers[1]					Upper Gila Aquifer[1]										Gila River[1]	Upper Gila Aquifer[2]				
WELL I.D.	MW-1	MW-2	CH-454	CH-467	MW-3	CH-708	CH-705	CH-425	LP-1	#20-1	#20	SW6	H-East	H-West	C-1	C-2	C-3	C-4	B-1	Gila R #2	D062831DAB2	D072702AA82	D072702ADD1	D072708DBC2	D072711BBB1
Date Sampled	6/15/92	6/12/92	6/14/92	6/15/92	6/13/92	7/23/92	7/23/92	6/16/92	9/15/92	6/6/92	6/11/92	6/7/92	7/17/92	7/17/92	7/17/92	7/17/92	7/17/92	7/17/92	7/17/92	6/11/92	7/18/85	7/18/85	7/15/75	7/18/85	6/26/90
Alkalinity (mg/L)	190	170	100	190	170	140	180	210	200	260	280	160	240	240	310	320	300	320	240	120	142	202		320	204
Calcium (mg/L)	2.3	3	44	3	3.5	110	44	27	9.0	1.5	2.6	6.8	190	530	82	42	17	680	44	30	64	5.6	4.3	100	3.4
Chlorides (mg/L)	290	300	500	310	280	150	130	140	400	125	84	270	170	200	240	320	370	290	230	48	120	260	240	320	220
Copper (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<10	<3		<9	0.001
Hardness (mg/L)	38	45	170	46	51	250	160	180	27	30	21	24	220	260	350	190	150	330	170	115	210	17	14	350	9
Iron (mg/L)	1.5	<0.2	<0.2	1.3	<0.2	<0.10	<0.10	5.4	<0.20	0.82	<0.2	1.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2	0.008	<3	<10	<9	0.009
Magnesium (mg/L)	14	18	16	28	17	2.7	2.7	35	1.4	4.1	26	14	2.7	2.7	2.8	2.7	2.7	2.7	2.7	19	13	0.6	0.9	25	0.23
Manganese (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.005	0.002	<10	<3	0.004
Nitrate (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	2.7	1.5	<0.10	<0.20	3.2	1.3	<0.10	2.7	3.1	7.1	5	5.6	7.9	1.9	<0.10	0.35		0.58		
pH	8.27	8.14	8.38	8.28	8.22	7.58	7.60	7.71	8.46	8.49	8.60	8.42	7.56	7.57	7.80	7.72	7.77	7.59	7.81	8.30	7.60	8.50		7.90	8.60
Potassium (mg/L)	6.4	7.9	12	6.4	6.3	5.5	4.5	8.5	<5.0	1.6	3.1	<0.20	0.5	[illegible]	5.1	3.9	4.1	5.4	4.3	4.9	5.5	2.8	4.3	6.5	3.2
Sodium (mg/L)	14	13	14	14	14	11	11	13	440	13	14	14	11	11	11	11	11	11	11	12	89	340	360	270	350
Specific Conductance (umhos/cm)	1900	1900	2500	1900	1800	1100	850	880	2200	1100	940	1800	1200	1300	1600	2000	2200	1800	1500	460	812	1630		2020	1660
Sulfate (mg/L)	290	280	400	320	250	200	60	84	190	92	84	280	95	110	120	720	270	190	140	40	68	150	250	180	250
Surfactants (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	0.03	0.03	<0.10	N/A	<0.10	<0.10	<0.10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.10					
TDS (mg/L)	1100	1100	1100	1100	1100	700	520	880	1000	640	880	1100	720	780	160.1	1200	1300	1100	880	300	487	956	1070	1170	1020
Zinc (mg/L)	<0.05	<0.05	<0.05	0.1	0.09	<0.05	<0.05	.028	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.042	0.008		0.015	0.007
Fluoride (mg/L)	23	13		18	17	1.2	1.2	1	8.5	20		20	5.3	4.7	5.2	13	13	6.7	7.8	2.1	1	7.7	14	2.8	10
TSS (mg/L)	720	<5		1800	<5	210	670	2100	N/A	54		<5	<5	<5	<5	<5	<5	<5	<5	440					
TRACE METALS																									
Arsenic (mg/L)	<0.005	<0.005		<0.005	<0.005	<0.01	<0.01	<0.005	0.005	0.05		0.02	<0.01	<0.01	<0.01	0.013	0.013	<0.01	<0.01	<0.005	0.003	0.1		0.005	0.09
Barium (mg/L)	<5.0	<5.0		<5.0	<5.0	<0.01	<0.01	<5.0	<0.01	<5.0		<5.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<5.0	0.024	0.008		0.044	<1
Cadmium (mg/L)	<0.02	<0.02		<0.02	<0.02	<0.001	<0.001	<0.02	<0.001	<0.02		<0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<1.0	<1		<3	<1
Chromium (mg/L)	<0.02	<0.02		<0.02	<0.02	<0.005	<0.005	<0.02	<0.02	<0.02		<0.02	0.007	<0.005	<0.005	0.009	0.012	0.009	0.014	<0.02					
Lead (mg/L)	<0.05	<0.05		<0.05	<0.05	<0.005	<0.005	<0.05	<0.01	<0.05		<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<10	<10		<30	<1
Mercury (mg/L)	<0.005	<0.005		<0.005	<0.005	<0.001	<0.001	<0.005	<0.002	<0.005		<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005					
Molybdenum (mg/L)	<0.10	<0.40		<0.40	<0.10	<0.40	<0.10	<0.10	<0.10	<0.40		<0.10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.10	<10	<10		<3	0.021
Selenium (mg/L)	<0.10	<0.10		<0.10	<0.10	<0.005	<0.005	<0.10	<0.10	<0.10		<0.10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.10	<0.10					
Silver (mg/L)	<0.02	<0.02		<0.02	<0.02	<0.005	<0.005	0.06	<0.005	<0.02		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02					

Source: GSi/water, 1992

(1) Sampled by GSi/water (2) Sampled by USGS

The quality of water which may occasionally accumulate in the bottom of the pit, and the quality of water which will leach through the waste rock dump, are related to the acid generating/neutralizing capacity of the rock and the leachable constituents.

The Sanchez orebody was formed when unmineralized andesite was intruded by a stock of copper bearing quartz monzonite porphyry. The andesite was fractured by the event, and mineralized solutions flowed outward from the stock into the fractures, creating a low-grade copper sulfide deposit in monzonite and andesite. This deposit was then oxidized to approximately 1,200 feet below the present ground surface, creating the present copper oxide orebody. The oxide orebody is underlain by a mixed oxide/sulfide zone, which grades into low grade sulfide mineralization at depth.

In the oxidation process, the original copper sulfide minerals were converted to chrysocolla, copper pitch, malachite and other copper minerals. These minerals are loosely known as copper oxides, since the sulfur in the original sulfides has been replaced by oxygen. The iron and other metallic sulfides present in the original orebody were likewise converted to oxides. The resulting oxide orebody is generally characterized by a higher-grade ore (>0.4% copper) centered on the monzonite stock, surrounded by lower-grade copper in the andesite. The copper grade in the andesite generally decreases with distance from the stock, dropping to below 0.1% copper within a few thousand feet.

During the oxidation process, sulfide minerals break down to produce a weak sulfuric acid solution, which leaches metals from the rock. These metals can then be redeposited as oxide minerals near by as the acid is neutralized, or transported to some remote location by the solution. In the case of Sanchez, the original orebody did not contain enough sulfide minerals to generate sufficient acid to transport the copper far from its original location. The oxide minerals formed when the acid was neutralized do not have the capacity to generate acid.

Since it is this oxidation which makes the deposit amenable to treatment by heap leaching, the bottom of the pit corresponds to the bottom of the oxidized zone. A small tonnage containing sulfide minerals will be encountered in the mixed zone near the bottom of the pit. Most of this sulfide will be in close association with oxide minerals and will be mined as ore. Samples of waste rock will be taken on a quarterly basis as a requirement of the Aquifer Protection Permit. Waste rock with significant acid generating potential will be placed on the leach pad, where the sulfides can break down and provide acid for copper leaching. Some sulfides could also be exposed in the pit walls.

The andesite and monzonite rock making up the orebody and the waste rock are strongly acid neutralizing, as are the basalt capping and valley-fill alluvium. A suite of 12 composite samples was

tested using procedures specified by the Arizona Department of Environmental Quality. The samples covered the two rock types making up the orebody, plus basalt and alluvium which will be deposited in the waste rock dump. All 12 samples exhibited a low acid generating potential (based on total and pyritic sulfur) and a relatively high acid neutralization potential. In the samples tested, the acid neutralizing potential ranged from 4 to 40 times greater than the acid generating potential. With the great mass of rock with high acid neutralizing potential, the small amount of acid generated by the sulfide minerals would be neutralized within a short distance of its point of origin. Extensive metallurgical testing of the ore also indicated that it is acid-consuming, requiring an average of 25 lbs of acid per ton to leach the copper.

Leaching tests conducted on andesite, monzonite, basalt and alluvium samples indicated low levels of leachable constituents, with total dissolved solids (TDS) in the 100 to 300 mg/L range. For comparison, TDS for water samples taken from the Gila River just south of the project site from 1987 through early 1992 averaged 466 mg/L. Selected wells in the vicinity of the project typically exhibited a TDS of well over 1000 mg/L. Heavy metals leached from the test samples were either at or below detection limits.

Because the rock mass to be mined has a very low acid generating potential, a high acid neutralizing potential and low leachable constituents, neither the water in the pit bottom nor the groundwater under the waste dump should be contaminated. Since any water in the pit bottom will be subject to continued evaporation, the TDS can be expected to increase with time, and may become too saline for wildlife consumption. Calcium, magnesium, and sodium chlorides and other salts can be expected to precipitate as the concentration increases. Water drawn from drill holes within the orebody indicate moderate TDS levels (average of four samples - 1100 mg/L) a pH averaging 8.0 and heavy metals content generally below detection limits.

3.3.4 Regional Surface Water

The Gila River is the major surface water source flowing east to west through the Safford Valley. The major tributary to the Gila River is the San Francisco River. A significant tributary to the Gila above the project area is Bonita Creek. The City of Safford has a major water intake on Bonita Creek which diverts water into a pipeline for use in the city's drinking water system. The City has a water appropriation of 3,240,000 gpd.

The Gila River flows past the project site, but a major portion of the water is diverted into the San Jose Canal for irrigation on the south side of the river. Approximately 43,000 gpm or 69,999 acre-feet were diverted in 1990. During periods of high flow, water will over-top the diversion dam and flow down the Gila. The water volume of the Gila near the project site is dependent upon the time of year, precipitation and irrigation demand. Water quality data have been collected along the Gila since the 1940s. A review of the water quality data is presented in Table 3-10.

3.3.5 Local Surface Water

The proposed operation would be located on small ephemeral drainages to the Gila River. The southernmost edges of the proposed pit and waste rock dump are over a mile north of the Gila River. The south pit rim elevation is 150 feet above the Gila River. The proposed heap leach pad would be located on lake bed clay terraces, more than one and a half miles north of, and nearly 400 feet above, the Gila River. The process ponds would be located between Head and Big Canyons, at the base of the leach pad. The operation would be located down-stream of and several channel miles distant from the Gila Box Riparian National Conservation Area (NCA). The proposed action should have no hydrologic impact on either the Gila River or the Gila Box Riparian NCA.

Most of the natural surface water flow in the local area near the project area is diverted for irrigation. Flow volume in the Gila River is dependent on time of year, precipitation, and irrigation demand. Typically, some surface flow occurs in all months except April through mid-July.

3.3.6 Project Area Surface Water

The proposed leach pad site is bounded on the west by the upper reaches of Tidwell Wash and on the east by Head Canyon. Unnamed canyons are present at the open pit site and the waste rock dump site. All drainages in the project area are ephemeral and carry water south to the Gila River. Runoff from the project area is limited to short periods after high intensity storms and slightly longer periods of flow during sustained rainfall events.

Analyses of surface water hydrology were completed to estimate the potential runoff for the drainages above the leach pad, open-pit and waste rock sites for various return periods. Estimates of the expected peak flows and runoff volumes for the drainages above the sites are presented in Table 3-11.

Table 3-10
SUMMARY OF WATER QUALITY DATA FROM SELECTED STREAMS
(Concentrations in milligrams/liter except as noted)

Constituents	Gila River at Solomonville 1943-44	Lower Bonita Creek (1940) 1955-57	Gila River above San Jose Dam 1940	Gila River above San Jose Wash 1941	Gila River above San Simon Creek 1940	Gila River at Calva, Arizona 1985-86
Silica	39	23-72	-	-	-	34-38
Iron	0.17	-	0.10	0.12-0.30	-	-
Calcium	51	(28)	56-96	31-62	90	43-110
Magnesium	12	(14)	11-24	9-16	26	10-40
Sodium	87	(5.6)	12-156	30-86	203	86-660
Potassium	a	-	-	-	-	3-12
Bicarbonate	204	(138)	155-327	127-199	327	199-340
Sulfate	39	(16)	4-58	25-51	102	61-440
Chloride	117	(7)	26-288	34-131	283	98-910
Fluoride	1.3	-	0.2-1.8	0.3-1.3	-	1.1-1.8
Nitrate	1.1	-	0.5-1.0	0.6-1.5	-	0.3-2.0
Borate	0.4	-	-	-	-	-
Total Dissolved Solids	454	265-401	185-729	194-445	865	940-2400
Hardness as CACO	117	152-168	155-338	116-221	332	150-440
EC at 25 C	74	371-395	33-148	34-80	154	725-3930
pH	-	-	-	-	-	8.1-8.5
Temperature C	-	-	-	-	-	27.5

SOURCE: Sergent, Hauskins & Beckwith, 1989

a. Na + K
b. Electrical conductivity = K X 10 at 25 C
c. Specific conductivity in microsiemens per centimeter at 25 C

Table 3-11
SUMMARY OF RUN-OFF ANALYSES FOR SANCHEZ COPPER PROJECT

Location	Return Period (years)	Duration (hours)	Precipitation (inches)	Peak Flow (cubic feet per second)	Run-off Volume (acre-feet)
Above Leach Pad, into Big Canyon	50	6	2.70	670	35
	100	6	3.00	787	41
	100	24	3.85	775	60
	500	24	5.20	1,151	91
Above Leach Pad, into Head Canyon	50	6	2.70	637	36
	100	6	3.00	749	43
	100	24	3.85	745	62
	500	24	5.20	1,107	94
Above Pit	50	6	2.70	1,100	57
	100	6	3.00	1,293	67
	100	24	3.85	1,272	98
	500	24	5.20	1,888	148
Above Waste Dump	50	6	2.70	3,038	172
	100	6	3.00	3,576	203
	100	24	3.85	3,560	294
	500	24	5.20	5,298	446

Source: Mining & Environmental Consultants, 1992

The method used to develop the storm hydrographs was the WASHMO model described by Ward and others (1981). This model is based on Soil Conservation Service procedures. A double triangle was selected for the unit hydrograph and all storm data were based on information presented by Sergent, Hauskins & Beckwith (1989 & 1992).

The drainage areas analyzed were the slopes above the heap leach pad to be routed into Big Canyon (0.46 square miles) and Head Canyon (0.48 square miles), the area above the open pit to be routed around the pit (0.76 square miles), and the area on and above the main waste dump to be routed to the ephemeral pond on the upstream side of the dump (2.3 square miles). The drainage areas are shown on Figure 3-8.

The diversion channels are designed to carry the peak flow from the 100-year, 24-hour storm with varying freeboard, and the 500-year, 24-hour storm with zero freeboard.

3.4 Soils

The surface soils in the project area range from very gravelly and cobbley sandy loams to clay loams. The soils include Soil Conservation Service series classifications of rough broken land, Graham extremely rocky clay loam, Anthony gravelly sandy loam, Continental-Pinaleno gravelly sandy loam to gravelly loam, and Arizona gravelly and sandy loam.

The lower drainage area of the mine pit site has poorly developed soils consisting mainly of coarse alluvial stream sediments of silt through cobble size. The upper part of the drainage basin consists of clayey gravel soil. Soils in the area are relatively shallow, and rock outcrops are common. Clayey gravel soil (Graham series) typically has a moderately slow to slow permeability with medium to rapid surface water runoff. The shrink/swell potential is generally moderate, and erosivity is low on moderate slopes. The soils on coarse stream terrace deposits (rough broken land) generally have slight to moderate erosivity and moderate to rapid permeability.

The level surface of the leach pad site contains shallow soils consisting of gravelly silt and clay to sandy silt (Continental-Pinaleno soils) with varying amounts of cobbles. A moderately to strongly cemented caliche layer in gravel and cobbles commonly is present at depths of about 1 to 5 feet. Steeper alluvial fan and colluvial surfaces along the front of the Gila Mountains have deep soils consisting of gravelly clays (Graham soils) to gravelly sands (Anthony soils). Cut slopes in the sand soils can be erodible. The clayey soils can have moderate shrink/swell potential. The maximum particle size is typically less than 2.5 inches (although larger sizes are common), and the percent passing a 200 mesh screen is typically less than 40%.

The soil moisture content (percent of dry weight) as determined in samples from 15 test pits located mainly in the leach pad area was 5%.

3.5 Vegetation

3.5.1 Vegetation Types

The project site is located in the Arizona upland region of the Sonoran desert near the interphase with the desert grassland [Benson & Darrow, 1981; Shreve & Wiggins, 1964]. The vegetation of the project area can be classified as desert scrub, an association dominated by low shrubs and succulents with a sparse presence of herbaceous plants.

The desert scrub association at lower elevations in the Gila River Valley has been described by Minckley and Sommerfield (1979) as uniformly dominated by creosote bush (Larrea tridentata), ocotillo (Fouquieria splendens), and prickly pears (Opuntia spp.). Subdominants include mesquite (Prosopis juliflora, blue palo verde (Ceridium floridum) on slopes, in areas of dissected valley fill, and within desert washes. Devil's cholla (Opuntia stanleyi) and Christmas cholla (Opuntia leptocavlis) generally occur on more level surfaces. Various other cacti, acacias (Acacia spp.) and wolfberry (Lycium spp.) are locally common but rarely dominant.

Major division of the desert scrub association at the project site include: desert washes, terraces and uplands. The vegetation of each topographic area is described below.

Desert Washes

Major species in the desert wash community include mesquite and cat-claw acacia (Acacia greggii). Associated species include white thorn acacia (Acacia constricta), wolfberry (Lycium spp.), spice bush (Aloysia wrightii), desert broom (Baccharis sarathroides), burrow bush (Hymenoclea salsola), shortleaf baccharis (Baccharis brachyphylla), blue paloverde, and creosote bush. Amid the shrubs, cacti are sparsely represented. Common cacti include: Engelmann's prickly pear (Opuntia phaecantha), purple prickly pear (Opuntia violacea), and cane cholla (Opuntia spinosior). Fluffgrass (Erioneuron pulchellum), and three-awn (Aristida adscensionis) are the most common grasses.

Terraces

The flat terraces are dominated by a dense stand of creosote bush and have Devil's cholla as a common associate. Other species present include snakeweed (Gutierrezia sarothrae), ocotillo, barrel cactus (Ferocactus wislizenii), and six-weeks-grama (Bouteloua barbata), tobosa (Hilaria mutica), and heronbill (Erodium cicutarium). The creosote bush community has microsites of poorly vegetated clay flats dominated by a sparse cover of snakeweed and fluff grass. These habitats were probably dominated by tobosa grass in the past.

Uplands

The uplands areas are dominated by a diverse creosote bush community that varies in floristic composition with elevation and exposure. Major shrubs species besides creosote bush include blue palo verde, mesquite, snakeweed, ocotillo, whitethorn acacia, cat claw acacia, wolfberry, desert zinnia (Zinnia acerosa), boundary ephedra (Ephedra aspera), janusia (Janusia gracilis), burro bush (Hymenoclea salsola), mendora (Mendora scabra), and brittlebush (Encelia farminosa). Common succulents include barrel cactus, Englemann's prickly pear (Opuntia phaecanthes), prostrate prickly pear, purple prickly pear, cane cholla, Christmas cholla, Fendler's hedgehog (Echinocereus fendleri),

and Graham's pincushion (Mammalaria grahamii). Common grasses include three-awn, side-oats grama (Bouteloua curtipendula), brome (Bromus rubens), tobosa, Arizona cottontop (Trichachne californica), tanglehead (Heteropogon contortus), curly mesquite (Hilaria berlangeri), slim tridens (Tridens muticus), and bush muhly (Muhlenbergia porteri). Plantago (Plantago sp.) and paperflower (Psilostrophe sp.) are common forbs. In general, creosote bush is dominant throughout the community. However, some south-facing slopes are dominated by blue palo verde and have few succulents.

Disturbances

Historically, the vegetation of the project site has been grazed by cattle and impacted by past mining activities. A portion of an upland area and the flat terrain at the foot of the uplands in the mine pit area has been disturbed by mining activities. Roads, drill pads, mine wastes, and mine portals have displaced much of the native vegetation. Many of the disturbed sites today are characterized by snakeweed, burro weed (Haplopapus tenuisectus), goldenhead (Acamptopappus sphaerocephalus), paperflower and brittlebush. Slim tridens, fluff grass, and tanglehead are common grasses present.

3.5.2 Threatened and Endangered Plants

Table 3-12 lists the threatened and endangered plants with known and probable occurrences on the Safford District of the Bureau of Land Management (BLM) and identifies their Federal status as well as their status on the BLM Safford District and the project site.

The night-blooming cereus (Cereus greggii var. transmontanus) is present on the project site. This plant, however, has a greater range and higher density than previously thought and has been downgraded to a 3C status, no longer under review.

All of the other eight plants of concern have specific habitat requirements not found on the project site and geographic ranges that do not include the project area. The Cochise pincushion cactus (Coryphantha robbinsorum), rosewood (Vauquelinia pauciflora) and Bartram's echeveria (Graptopetalum bartramii) are known only from sites near the Mexican border. The Arizona hedgehog (Echinocereus triglochidiatus var. arizonicus) and Pringle's fleabane (Erigeron pringlei) are best known from the Pinal and Mescal Mountains while the beeplant (Cleome multicaulis) and needle spine pineapple cactus (Echinomastus erectrocentra var. erectrocentra) are known from Cochise and Eastern Pima counties.

Table 3-12
THREATENED AND ENDANGERED PLANT SPECIES
Safford District BLM

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	SAFFORD STATUS	STATUS ON PROJECT AREA
Cleome multicaulis	Beeplant	2	P	N
Cereus greggii var. transmontanus	Night-blooming cereus	3C	O	N
Coryphantha robbinsorum	Cochise pincushion cactus	T	O	N
Echinocereus triglochidiatus var. arizonicus	Arizona hedgehog cactus	E	O	N
Erigeron pringlei	Pringle's fleabane	2	P	N
Erigeron lemmonii	Lemmon's fleabane	2	P	N
Graptopetalum bartramii	Bartram's escheveria	2	P	N
Echinomastus erectrocentra var. erectrocentra	Needle spine pineapple cactus	2	O	N
Vaquelinia pauciflora	Rosewood	2	O	N

O = Known occurrence
P = Probable occurrence
E = Endangered
T = Threatened
N = Habitat requirements for the species are not met
2 = Federal candidate for listing
3C = Larger representation than previously believed

SOURCE: Safford District Resource Management Plan Environmental Impact Statement, 1991 and Mining & Environmental Consultants, Inc., Biological Impact Study, 1991.

3.5.3 State-Protected Plants

The Arizona Native Plant Law (ARS Chapter 7) effective 9/21/91 defines and lists protected groups of plants in five categories:

1. Highly Safeguarded native plants are those whose prospects of survival are in jeopardy and are afforded exclusive protection.
2. Salvage Restricted native plants are those species not in jeopardy but subject to a high potential for damage by theft or vandalism.
3. Export Restricted native plants include those species not included as highly safeguarded but which would be subject to depletion if their export from the state were permitted.
4. Salvage Assessed native plants include species not included in the above categories but which have sufficient value if salvaged to support the cost of tags and seals.
5. Harvest Restricted native plants are those not in the safeguarded category but which are subject to excessive harvesting or overcutting.

Plant species listed in the Arizona Native Plant Law which are known to occur on the project area or are known from adjacent areas, with the protection category, are listed in Table 3-13. None of the species listed in the Highly Safeguarded category occur in the project area or are known from habitats similar to those in the project area.

Permission will be obtained from Arizona Department of Agriculture before any State-Protected plants are moved or salvaged.

3.5.4 Wetlands

The study area is characterized by numerous dry washes, draining south to the Gila River. Only 14 acres of these washes are classified as "Waters of the United States" by the U.S. Army Corps of Engineers, but do not have sufficient water to sustain wetlands. [M&EC, 1991] There are no wetlands on the project site.

Table 3-13
STATE-PROTECTED PLANTS
Plant Species in Project Area Listed in Arizona Native Plant Law

SCIENTIFIC NAME [1]	COMMON NAME [1]	Status in Project Area [2]	Protected Category [3]
Agave palmeri	Palmer agave	P	SR
Dasyliron wheeleri	Desert spoon	O	SR
Nolina microcarpa	Bear grass	P	SR,HR
Yucca baccata	Banana yucca	P	SR
Yucca elata	Soaptree yucca	O	SR
Zephyranthes longifolia	Rain lily	P	SR
Cereus greggii	Night-blooming cereus	O	SR,ER
Coryphantha vivipara	Arizona beehive cactus	P	SR
Echinocereus fasciculatus	Bundle hedgehog	P	SR
Echinocereus fendleri	Fendler hedgehog	O	SR
Echinocereus triglochidiutus	Clarel-cup hedgehog	P	SR
Ferocactus wislizenii	Fish-hook barrel	O	SR
Mammillaria grahamii	Graham fish-hook	O	SR
Opuntia leptocaulis	Christmas cactus	O	SR
Opuntia phaecantha var. major	Major prickly pear	O	SR
Opuntia phaecantha var. discata	Englemann prickly pear	O	SR
Opuntia spinosior	Cane cholla	O	SR
Opuntia stanleyi	Devil cholla	O	SR
Opuntia violaceae var. macrocentra	Purple prickly pear	O	SR
Fouquieria splendons	Ocotillo	O	SR
Allium bigelovii	Onion	P	SR
Calochortus sp.	Mariposa lily	O	SR
Dichelostemma pulchellum	Bluedicks	O	SR
Cercidium floridum	Blue palo verde	O	SA,HR
Prosopis velutina	Velvet mesquite	O	SA,HR

1 - Names are those used in Arizona Native Plant Law
2 - P = Possible occurrence (occurs near project area)
O = Occurs in project area

3 - HS = Highly Safeguarded
SR = Salvage Restricted
ER = Export Restricted
SA = Salvage Assessed
HR = Harvest Restricted

SOURCE: Mining & Environmental Consultants, 1991.

3.6 Wildlife

3.6.1 Wildlife Habitat

The Sanchez Copper Project area is located on the eastern edge of the Sonoran Desert in the Sonoran desert scrub association - Arizona upland subdivision [Lowe and Brown, 1973; Brown, 1973]. As a result of the area's relatively high elevation in a broad transition between the Sonoran and Chihuahuan Deserts, the climate is too cold to support many typical Sonoran Desert plants. The resulting wildlife community is correspondingly scarce of species characteristic of the Sonoran Desert.

The project site was visited by wildlife specialists during 1989, 1990 and 1991 to observe plant and animal species. Intensive surveys were conducted under the supervision of Professor Stephen Bingham, M.S., in December 1989; May-June 1990; and October 1991. [Mining & Environmental Consultants, Inc., 1991.]

Habitats present on site include creosote bush shrubland and Sonoran desert scrub, with intervening desert washes. Section 3.5 Vegetation provides a detailed discussion of local vegetative communities. Although the washes support many of the same plant species found in the two former communities, plants in this relatively moister environment are more vigorous and occur at higher densities than those in upland situations. Wash habitats typically support the highest densities and diversities of the three habitats present on site. Although washside vegetation may be considered "xeric riparian", there are no permanent water sources or true riparian habitats on or adjacent to the project area.

3.6.2 Wildlife Species

Wildlife present on the project area are typical for the acreage and types of upland habitats present, although numbers of some species have been adversely and beneficially affected by past mining activity on site. Adverse effects include habitats impacted by historic and exploration roads, drill pads, and other mine-related facilities totalling 245 acres. Beneficial effects include a tank which seasonally supports free-standing water and a vigorous stand of palo verde.

Wildlife inhabiting the project area and the surrounding habitats are primarily nocturnal with the exception of a few hardy birds and reptiles. The local wildlife community is described below by taxonomic group.

Several species of small, common lizards, such as the greater earless lizard (Cophosaurus texanus

scitulus), side-blotched lizard (Uta stansburiana stejnegeri), and whiptails (Cnemidophorus spp.), occur on the project area. The Gila Monster (Heloderma suspectum) is also present on or near the project area. Although no snakes were observed during baseline surveys, a wide variety of snakes, including rattlesnakes (Crotalus spp.), whipsnakes (Masticophis spp.), kingsnakes (Lampropeltis spp.), and others probably occur on site.

The lack of any permanent water on the project area restricts amphibian presence. Although no amphibians were detected during baseline surveys, it is possible that several species of spadefoot toads (Scaphiophus hammondi, S. couchi, and S. bombifrons) and the red-spotted toad (Bufo punctatus) are present.

A relatively scarce avifauna is present on the project area because of habitat limitations. Common, characteristic species include the black-throated sparrow (Amphispiza bilineata), rock wren (Salpinctes obsoletus), mourning dove (Zenaida macroura), house finch (Carpodacus mexicanus), Gambel's quail (Callipepla gambelii), phainopepla (Phainopepla nitens), and turkey vulture (Cathartes aura). White-winged dove (Z. asiatica), hawks (Buteo spp.) and other raptors have been observed in the area. Although the project area is not on a major flyway, migratory waterfowl seasonally utilize ponds, lakes, streams, and the Gila River in the Safford area. It is possible that such waterfowl will be attracted to the on-site ponds.

A variety of bats hunt on the project area. They roost in natural rock outcrops and were roosting in the historic mine adits until recently.

Nongame and small game mammals inhabiting the site include mice (e.g., Peromyscus spp.), pocket mice (Perognathus spp.), kangaroo rats (e.g. Dipodomys merriami), ground squirrels (Spermophilus spp.), cliff chipmunk (Eutamias dorsalis), desert cottontail (Sylvilagus audubonii), and black-tailed jack-rabbits (Lepus californicus).

Predators in the area include bobcats (Felis rufus), coyotes (Canis latrans), gray (Urocyon cinereoargenteus) and kit fox (Vulpes macrotus), badgers (Taxidea taxus), skunks (Mephitis mephitis, Conepatus mesoleucus, and Spilogale gracilis), and ringtails (Bassariscus astutus). Raccoons (Procyon lotor) and coatis (Nasua nasua) have been reported from the adjacent Gila River bottom. Mountain lion (Felis concolor) are thought to occasionally range across the project area.

Big game in the project area include javelina (Tayassu tajacu), mule deer (Odocoileus hemionus), and an occasional transitory black bear (Ursus americanus). At least part of the home ranges of two

javelina herds are thought to overlap the project area. Some of the better javelina habitats in the area are the desert washes and the proposed site of the waste rock dump, which supports an abundance of prickly pear, as well as bottom cover, shallow caves, and old diggings relatively close to water along the Gila River bottom. Although there is considerable dietary overlap between deer and cattle in the area because of plant community composition, even the upper elevations of the project area can only be considered marginal deer habitat.

Project workers and others have sighted a few feral goats in the northern portion of the project area. The present distribution of bighorn sheep (Ovis canadensis) in the Gila Mountains approaches the project area from upper Bonita and Eagle Creeks, approximately 10 miles away.

3.6.3 Threatened and Endangered Species

With the exception of California leaf-nosed bats and cave myotis, both federal C2 candidates [USDI FWS 1989], no federal or state endangered, threatened, candidate, or sensitive [USDI BLM, 1991] species are known to seasonally inhabit the project area or any off-site areas that could be potentially affected by the project. The California leaf-nosed bat also is listed as a candidate species by Arizona [Arizona Game & Fish Dept., 1988].

The adits used as shelter by the bats were closed during January, 1992 under the supervision of the BLM and Arizona Game & Fish Department, and with the concurrence of the U.S. Fish & Wildlife Service.

An additional 2,700 feet of mine workings, at the bottom of a 300-foot vertical shaft, are also present in the ore deposit. The top of the shaft is reportedly sealed, although it is unknown if it is sealed to the extent of excluding all bats.

Although not known to be present, several other threatened, endangered, and candidate species have regional distributions overlapping the project area or occur in the vicinity. Several sensitive fish species, including the Gila chub (Gila intermedia) and razorback sucker (Xyrauchen texanus), occur in the Gila Box Riparian National Conservation Area (NCA) approximately three miles upstream from the project area. Their downstream distribution is restricted by agricultural diversions where the entire Gila River is diverted into ditches. Washes draining the project area are located between the first and second diversions. No sensitive fish occur downstream of the project area above San Carlos Reservoir, approximately 50 miles downstream.

Bald eagles (Haliaeetus leucocephalus) seasonally occur along the Gila River and may occasionally hunt adjacent uplands. Peregrine falcons (Falco peregrinus) probably migrate through the area, although there are no known eyries nearby or on-site habitat that would be particularly attractive for hunting. The northeast distributional limits of the desert tortoise (Gopherus agassizii) are in the lower San Pedro basin, approximately 70 miles from the project area. A Federal Candidate 2 species, the Texas horned lizard (Phrynosoma cornutum), is an upland species that is locally common in southeastern Arizona. Although not known north of the Gila River, some habitat on the project area is potentially suitable for this species.

Arizona ridge-nosed rattlesnakes (Crotalus willardi willardi) occur most commonly in moist canyons in coniferous forest to pine and pine-oak woodland, but also occur in adjacent, more arid woodland and ecotonal grassland habitats. A subspecies (C. w. obscurus) occurring in extreme southwestern New Mexico and adjacent Mexico is federally listed as Endangered. Ridgenoses have been reported from the Chiricahua Mountains several times, but whether it is the obscurus form that occurs there (if indeed any ridgenose does) remains to be confirmed by specimens or detailed photographs. [Arizona Game and Fish Department, 1988]

3.7 Land Use Considerations

3.7.1 Land Use and Land Use Plans

Present land use of the project site includes mineral exploration, grazing, and wildlife habitat. The land use of the surrounding area also includes recreation and farming.

The most recent land use plan developed by the BLM that includes the project area is the Safford District Resource Management Plan. The final Environmental Impact Statement for this plan was issued on September 13, 1991. The Resource Management Plan provides management guidance for the District for a 15-year period. This project is consistent with the Resource Management Plan.

3.7.2 Recreation

Public lands provide the setting for a wide variety of recreation opportunities in the Safford Valley. Though most opportunities are for dispersed activities, developed recreation sites are also present. The major recreation areas near the project site are the Gila River, Gila Box, and Bonita Creek. Activities vary from off-highway vehicle driving, to back country hiking along Bonita Creek, or rafting on the Gila River. The Sanchez Road is the main public access.

Recreation activities on the project area currently include hunting, hiking, horseback riding, rock-hounding, and off-highway-vehicle driving, but these are limited by available resources.

3.7.3 Wilderness and Congressional Designations

The Arizona Desert Wilderness Act was signed in November 1990. None of Arizona's wilderness areas will be affected by the project. Although the Gila Box was released from future study as a wilderness area, Congress designated a portion of the Gila River and Bonita Creek as a Riparian National Conservation Area. The Gila Box is located approximately 3 miles northeast of the project area, and is upstream.

There are no wild and scenic rivers designated within the Safford District, but in the approved Safford District Resource Management Plan, both Bonita Creek and the Gila River are eligible, and are managed within the interim management prescriptions until Congress acts.

3.7.4 Grazing

Two grazing allotments currently overlap the project area. Cattle are grazed year round in a two-pasture rotation system. Cattle are kept off desert grasslands until after the grass has cured in the fall for winter grazing. Carrying capacity of the range is extremely low, 3 to 4 cows per square mile.

The grazing allotments currently operating within the project area are the Lone Star Allotment, which is authorized for 152 cows year round, and the Sanchez Allotment, which is authorized for 14 cows year round.

3.7.5 Wild Burros and Horses

There are no wild burros or horses on or near the project site; they are not known to occur anywhere in the Safford District.

3.7.6 Areas of Critical Environmental Concern (ACECs)

Thirteen areas have been proposed for ACEC designation in the final Resource Management Plan. Three areas within 12 miles of the project have been proposed as ACECs -- Gila Box Outstanding Natural Area, Eagle Creek Bat Cave, and 111 Ranch Research Natural Area. The Gila Box Riparian National Conservation Area is about 3 miles upstream of the project area. In addition, Bonita Creek, 4 miles from the project site, has been proposed as a Watershed Coordinated Resource Management Plan Area.

3.8 Cultural Resources

3.8.1 Consultations / Existing Data Review

Six Class III (Intensive) Archaeological Surveys were conducted by SWCA, Inc. environmental consultants of Tucson. The surveys covered all areas within the project boundaries planned for development. SWCA consulted with the BLM and reviewed files for existing information before commencing the on-site surveys.

The BLM and a utility company have conducted two additional surveys within the project area. A 1978 Arizona Electric Power (AEPCO) Transmission Line Survey traversed the leach pad area and identified a large site with lithic scatter, rock piles, and rock alignments. A second survey of about five acres, overlapping a portion of the proposed conveyor route, was completed in house by the BLM and yielded no cultural resources.

The SWCA surveys identified 38 sites (36 prehistoric and two historic) in or near areas to be disturbed. These sites consist of prehistoric agricultural-related resources with gridded gardens, contour terraces, and surface artifact scatters. Other sites of unknown cultural affiliation contain possible roasting pits, prehistoric trails, rock piles, check dams, cleared circles, and artifact scatters. One possible prehistoric habitation site and one temporary prehistoric habitation site were identified. The nearby Civilian Conservation Corps camp served as the southern Arizona headquarters for the Civilian Conservation Corps. Another historic site is the remains of a stone house constructed in 1918. The stone house is immediately outside the project boundary, about 2,500 feet south of the open pit.

See Appendix G for documentation of compliance with federal archaeological laws. The San Carlos Apache Tribe was contacted with regard to Native American religious concerns, which is also documented in Appendix G.

3.8.2 Summary and Recommendations

All 38 sites have been determined to be eligible for inclusion in the National Register of Historic Places, under the provision that they may be likely to yield information important in history or prehistory. A proposal for mitigation of direct and indirect effects of mining on cultural sites has been reviewed by the BLM and the Arizona State Historic Preservation Officer and found to be acceptable.

3.9 Aesthetics

3.9.1 Visual Resources

A visual impact study was performed by Mining & Environmental Consultants in 1991. The project area is located in a Class IV Visual Management Area, as mapped by the BLM. Major modifications can occur in Class IV areas. The scenic quality of the area is rated at "C," indicating an absence of significant scenic values.

A number of mine facilities will be visible from adjacent landowners' property, from U.S. Highways 666 and 70, and from populated areas of the Gila Valley.

3.9.2 Noise

Noise will be produced by mobile equipment, crushers, and blasting. The distance to the nearest residence is approximately 0.5 mile.

3.10 Socioeconomics

Socioeconomic information has been obtained from The Socioeconomic Impact of the Sanchez Copper Oxide Project, Safford, Arizona, prepared by George F. Leaming, Ph.D., Western Economic Analysis Center (WEAC), 1991, and supplemented in 1992.

Graham County, with a 1990 population of 26,554, has experienced relatively steady growth in both population and economic activity for the past two decades. The local economy is based largely on agriculture (mostly the growing of cotton) as well as federal, state and local government. Significant contributions to the local economy are also made by employees of copper mining facilities in nearby Greenlee County who reside in the eastern Gila Valley part of Graham County. Unemployment in 1990 averaged 7.4% of the Graham County labor force, with the total number of persons employed, including seasonal farm workers and those who are self-employed, at about 7,550. The Graham County economy has a well-developed public and private infrastructure with a modest amount of unused capacity in most sectors.

3.10.1 Employment

In 1990, the civilian labor force in Graham County, Arizona, averaged 8,150, while the number of

employed persons averaged 7,550, for an average unemployment rate in the county of 7.4%. This was the lowest unemployment rate experienced in the county in the past decade, and the total number of persons employed was the highest. As shown in Table 3-14, however, part of the decline in the unemployment rate since the high of 22.3% reached in 1983 was the result of a declining labor force, as unemployed persons left the county during the recession of the early 1980's to find work elsewhere or withdrew from the labor force. In 1990, the civilian labor force in Graham county was still 8% below the high reached in 1982.

The residents of Graham County are heavily dependent upon a limited number of activities for jobs. As shown in Table 3-15, these include the retail and wholesale trade sectors and federal, state and local government In addition, seasonal agricultural work employs a large number of the county's residents, and many of the county's residents work outside the county, primarily at mining operations in Greenlee County.

Table 3-14
LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT IN GRAHAM COUNTY, ARIZONA
1980-1990

YEAR	LABOR FORCE	EMPLOYMENT	UNEMPLOYMENT RATE
1980	8,125	7,350	9.8%
1981	7,950	7,200	9.6
1982	8,875	7,050	20.2
1983	8,675	6,725	22.3
1984	7,775	7,125	8.2
1985	7,675	6,750	11.9
1986	7,650	6,775	11.6
1987	7,625	6,850	10.2
1988	7,875	7,050	10.5
1989	7,875	7,250	8.1
1990	8,150	7,550	7.4

SOURCE: WEAC, 1991, from Arizona Department of Economic Security

Table 3-15
COVERED WAGE AND SALARY EMPLOYMENT

IN GRAHAM COUNTY, ARIZONA
FIRST QUARTER, 1990
(by place of work)

INDUSTRY	NUMBER OF EMPLOYEES	PERCENT
Agriculture (1)	220	3.9
Mining	0	.0
Manufacturing	180	3.2
Construction	170	3.0
Transportation, Public Utilities	125	2.2
Wholesale and Retail Trade	1,530	27.4
Finance, Insurance, Real Estate	100	1.8
Services	825	14.8
Federal Government (2)	290	5.2
State and Local Government	2,150	38.5
TOTAL	5,590	100.0

Includes only employees covered by the employment security laws of Arizona. Does not include self-employed persons, who are mostly in trade, services, and agriculture. Workers who live in Graham County but work outside the county are also excluded.

(1) Excludes more than 1,000 seasonal farm workers not covered by the employment security laws of Arizona.

(2) Excludes some federal government workers not covered by the employment security laws of Arizona.

SOURCE: WEAC, 1991, from Arizona Department of Economic Security

3.10.2 Income

Because of the significant numbers of self-employed persons in Graham County and the large numbers of county residents who work outside of the county, personal income flows constitute a much better measure of the relative importance of the various industries and sources of income to the county's economy than do official employment figures by place of employment.

Total personal income received by residents of Graham County has risen substantially since the early 1980s. As shown in Table 3-16, the total amount of personal income received by those living in Graham County has climbed by almost half since the recession low of 1982 to exceed $226 million in 1988, the latest year for which reliable estimates are available.

Table 3-16
PERSONAL INCOME RECEIVED BY RESIDENTS OF GRAHAM COUNTY, ARIZONA
1981-1988

YEAR	WAGES AND SALARIES (1)	TOTAL PERSONAL INCOME (2)
1981	$54,475,000	$151,924,000
1982	58,058,000	151,537,000
1983	62,060,000	157,720,000
1984	66,698,000	175,961,000
1985	71,618,000	177,752,000
1986	76,325,000	191,048,000
1987	82,770,000	209,428,000
1988	90,027,000	226,195,000

(1) Earned by place of work.
(2) Received by place of residence.

SOURCE: WEAC, 1991, using data obtained from the Bureau of Economic Analysis, United States Department of Commerce, and Arizona Department of Economic Security.

As shown in Table 3-17, the total of $226,195,000 received by residents of Graham County in 1988 came largely from a limited number of sources. The largest was government, including federal, state, and local, and including both transfer payments (social security, other retirement benefits, and welfare payments) and wages and salaries paid by government agencies. Dividends, interest, and rents were also a large source of personal income in Graham County in 1988, but much of this personal income involved payments made by residents of the county to other residents of the county, as basic income brought in from outside circulated within the local economy. The sources of this basic personal income, from which all other income is derived by local circulation, are shown in Table 3-18.

Table 3-17
PERSONAL INCOME OF GRAHAM COUNTY RESIDENTS
1988

SOURCE OF INCOME	AMOUNT OF PERSONAL INCOME
Earnings by industry:	
Agriculture and related	$ 13,512,000
Mining	89,000
Construction	9,349,000
Manufacturing	3,005,000
Transportation, Public Utilities	7,594,000
Wholesale and Retail Trade	19,532,000
Finance, Insurance, Real Estate	3,431,000
Services	19,806,000
Federal Government	8,406,000
State and Local Government	41,496,000
Dividends, Interest, Rent	30,708,000
Net Transfer Payments (1)	49,369,000
Income Earned Outside the County	19,898,000
TOTAL	$ 226,195,000

(1) Total transfer payments minus personal contributions for social insurance.

SOURCE: WEAC, 1991, using data obtained from the Bureau of Economic Analysis, United States Department of Commerce.

Table 3-18
BASIC PERSONAL INCOME RECEIVED BY RESIDENTS OF GRAHAM COUNTY, ARIZONA
1988

SOURCE OF INCOME	AMOUNT OF INCOME	PERCENT
Agriculture and related	$ 13,512,000	11.6
Mining	89,000	0.1
Manufacturing for export	901,000	0.8
Tourism	650,000	0.6
Federal Government Employment	8,406,000	7.2
State Government Employment	23,950,000	20.5
Income Earned Elsewhere	19,898,000	17.0
Retirement and Welfare	49,369,000	42.2
TOTAL	$116,775,000	100.0

SOURCE: WEAC, 1991, based on data from the United States Department of Commerce.

3.10.3 Population

In 1990, the United States Bureau of the Census determined the population of Graham County, Arizona, to be 26,554 persons, of whom nearly half (some 12,845) were residents of the incorporated municipalities of Safford, Thatcher, and Pima in the eastern Gila River Valley portion of the county. It is estimated that approximately another 1,000 persons live in the unincorporated area of the county within the Solomonville School District. These are the populations closest to the proposed Sanchez Copper Project and comprise the community that would be most affected by its development and operation.

The population of Graham County has grown rather steadily over the past 20 years, as shown in Table 3-19. From 1980 to 1990, the population increased by 16%, representing the sixth slowest growth rate among Arizona's 15 counties during that 10 year period, well below the population growth rates realized in Arizona's two major metropolitan areas.

Table 3-19
POPULATION IN GRAHAM COUNTY, ARIZONA
1970 - 1990

YEAR	POPULATION	YEAR	POPULATION
1970	16,578	1981	23,100
1971	17,500	1982	23,700
1972	17,600	1983	23,600
1973	18,700	1984	23,800
1974	20,000	1985	23,800
1975	19,700	1986	23,900
1976	20,900	1987	24,400
1977	21,000	1988	25,100
1978	20,700	1989	25,900
1979	21,300	1990	26,554
1980	22,862		

SOURCE: WEAC, 1991, based on data from the United States Bureau of the Census and the Valley National Bank of Arizona.

3.10.4 Housing

In 1980, Graham County had 7,193 year-round housing units, of which 6,587 (91.6%) were occupied. Of those occupied units, 4,870 (73.9%) were owner-occupied. Since 1980, a total of more than 2,134 housing units have been added to the county's housing supply by new construction, as shown in Table 3-20.

Table 3-20
HOUSING CONSTRUCTION IN GRAHAM COUNTY, ARIZONA
1981 - 1990

YEAR	VALUE OF RESIDENTIAL BUILDING		NEW HOUSING UNITS
1981	$ 4,646,000		246
1982	2,517,000		194
1983	1,622,000		189
1984	3,799,000		240
1985	3,383,000		243
1986	2,632,000		228
1987	3,773,000		278
1988	3,731,000		282
1989	4,226,000		234
1990	3,168,000	(1)	N/A

(1) Preliminary

SOURCE: WEAC, 1991, based on data from the Center for Business Research, Arizona State University, and Division of Economic and Business Research, University of Arizona.

Of the new housing units erected in Graham County during the period from 1981 through 1989, 72% were mobile homes. Only a third of the total new housing units were in the incorporated municipalities of Safford, Thatcher, or Pima. The remainder were built or installed in the unincorporated areas of the county, mostly in the Gila River Valley around the incorporated areas.

3.10.5 Tax Revenues

Graham County collects part of its revenues from property taxes and part in sales and other tax disbursements from the State of Arizona under a formula established by legislation and based on local property taxes levied and local collections of state sales and other taxes. In fiscal 1990, Graham County obtained $1,518,000 from the State through such disbursements and collected $822,629 in county property taxes. The property taxes were collected on assessed property located within the county. The various classifications of this property and the assessed valuations of each class in 1989 are shown in Table 3-21.

The incorporated municipalities of Safford, Thatcher, and Pima obtain their revenues from local sales taxes, local property taxes, and through the disbursement of state sales and other taxes based on population. Property taxes form a relatively small part of government revenues in these municipalities.

Table 3-21
PROPERTY TAX BASE OF GRAHAM COUNTY, ARIZONA
1989

CLASS OF PROPERTY	NET ASSESSED VALUATION PRIMARY	SECONDARY
Agricultural Property, Vacant Land	$ 13,043,210	13,296,417
Producing Mines and Timber	105,798	105,798
Railroads	302,752	324,412
Public Utilities	6,713,859	6,713,859
Other Commercial, Industrial Property	16,405,263	16,438,132
Rented Residential Property	4,029,001	4,073,354
Owner-occupied Residential Property	19,026,001	19,152,784
Historic Property	7,840	7,840
TOTALS	$ 59,633,999	60,022,601

SOURCE: WEAC, 1991, based on data from the Arizona Department of Revenue

School districts obtain their revenues from the taxes levied on the property within their jurisdictions and through the distribution of state sales tax and other taxes, including mining severance taxes, according to a formula established by law and based on average daily student membership. In 1989-90, the Solomonville School District obtained 74.2% of its revenues from the distribution of state taxes and 24.7% from the property tax, with the remaining 1.1% coming from Graham County. The composition of the Solomonville School District property tax base is shown in Table 3-22.

Table 3-22
PROPERTY TAX BASE OF THE SOLOMONVILLE SCHOOL DISTRICT
1989

CLASS OF PROPERTY	NET ASSESSED VALUATION PRIMARY	NET ASSESSED VALUATION SECONDARY
Agricultural Property, Vacant Land	$,688,341	$ 1,692,055
Producing Mines and Standing Timber	55,317	55,317
Railroads	64,783	66,940
Public Utilities	2,469,621	2,469,621
Other Commercial, Industrial Property	227,431	229,861
Rented Residential Property	236,936	244,593
Owner-occupied Residential Property	952,706	965,934
TOTALS	$ 5,695,135	$ 5,724,321

SOURCE: WEAC, 1991, using data from Arizona Department of Revenue

3.10.6 Public Facilities and Services

Education

Primary and secondary education were provided to 5,201 students in Graham County in 1989-1990 by eight public school districts, of which four were elementary school districts and four were unified elementary and high school districts. The Sanchez Project is located in the Solomonville School District, which served 198 elementary school students and 86 high school students in 1989-1990. The Solomonville School District, however, is an elementary school district, and its high school students actually attend school in Safford.

In 1989-1990, Graham County public schools had total revenues of $20,618,752, with $4,479,000 (22%) of that coming from local sources, mostly the property tax; another $15,666,438 (76%) from state aid, mostly through the direct distribution of sales and severance tax revenues; and $473,293 (2%) in federal aid. The Solomonville School District had total revenues of $1,072,936, with $265,344 (25%) of that coming from local sources, mainly the property tax, and $795,998 (74%) from state aid, with the remaining 1% coming from federal sources.

Graham County is also served by a two-year community college, Eastern Arizona College. In 1989, the college had an enrollment of 4,796 students and a faculty of 335. About 90% of the students come from outside of the county.

Health Care

Primary health care is provided in the Gila Valley area of Graham County by 10 physicians, 3 ophthalmologists, one osteopath, 4 chiropractors, 8 dentists, 3 orthodontists, and 4 optometrists, all in private practice. Hospital care is provided by the Mount Graham Community Hospital, a publicly owned 42-bed medical facility. The hospital is funded by a community hospital district with the power to levy property taxes. The county is also served by the Safford Care Center, a 128-bed skilled nursing facility located in Safford.

Utilities

Electrical energy and natural gas are provided to residents of Safford by the City of Safford. In Thatcher and Pima, and in all other areas of the Gila Valley of eastern Graham County, electricity and natural gas are provided by the Graham County Electric Cooperative, Inc., and Graham County Utilities, Inc. These are essentially service entities supplying power generated by the Arizona Electric Power Cooperative, which has a coal-fired power plant near Willcox in Cochise County, south of Graham County, and with natural gas supplied by the El Paso Natural Gas Company.

Telephone communications service is provided by US West Communications of Denver.

Domestic water is provided by the City of Safford in Safford itself, and in the Town of Thatcher, and in the unincorporated areas immediately adjacent to the two municipalities. Graham County Utilities, Inc. provides domestic water service in the Town of Pima and the small unincorporated community of Fort Thomas. In other unincorporated areas of the county, domestic water is provided by small private water systems. The Gila Valley Irrigation District provides agricultural water to farmers in the Gila Valley.

Sewer service is provided in Safford by the City of Safford. The Town of Pima operates a sewer system serving itself and the Town of Thatcher as well as some adjacent residential areas outside of town limits. Some residential subdivisions in other unincorporated areas of the county have small, private sewer systems.

Other Community Services

Graham County also has three historical museums, one in each of the county's incorporated municipalities.

3.11 Transportation

Two U.S. highways traverse Graham County and provide access to its major communities. U.S. Highway 70 runs generally east-west through the population centers of the Gila River Valley in Graham County, connecting them with Phoenix to the west and El Paso, Texas (via Lordsburg, New Mexico, and Interstate 10) to the east. U.S. Highway 666 extends south from Safford to Interstate 10, Willcox, and Tucson, and northeast to the mining communities of Greenlee County. The Sanchez Copper Project is served by a county road which runs northeast from Safford.

The City of Safford operates a municipal airport with two 4,800' paved and lighted runways. The airport is located northeast of the city, between the Sanchez Copper Project and the urbanized areas of the valley.

A branch line railroad operates freight service through Safford from Miami, Arizona, on the west, connecting with the main line of the Southern Pacific Railroad at Lordsburg, New Mexico, on the east. [WEAC, 1991]

The proposed access is on existing roads and bridges. The following local traffic counts (Table 3-23), tabulated as "Average Daily Traffic," were provided by the Graham County Engineer.

Table 3-23
LOCAL TRAFFIC COUNTS - 1991

LOCATION	AVERAGE DAILY TRAFFIC
8th Avenue (Safford) Bridge	2,500
Airport Road	1,300
Sanchez Road at end of Airport Road	190
Sanchez Road at Sanchez	110
Solomon Bridge	270
Sanchez Road from U.S. Hwy 70 to Solomon Bridge	270
U.S. Hwy 70 between 8th Avenue and U.S. Hwy 666	12,000
U.S. Hwy 70 between U.S. Hwy 666 and Sanchez Road Intersection	5,300

The 8th Avenue (Safford) Bridge is 22 feet wide and 1,100 feet long. The bridge will accept all legal load limits for county, state and federal highways.

The Solomon Bridge is designed for rural use, and the load limits have not been determined. This bridge would be adequate for employee traffic, but because it is narrow and has sharp curves at the approaches, it would not be adequate for repeated large truck traffic. Sanchez Road on both sides of the Solomon Bridge has periodically washed out during flooding of the Gila River.

The road dimensions of 8th Avenue and the Airport Road meet or exceed minimum standards for county road design. The Sanchez Road meets minimum standards for a rural collector. There is no additional right-of-way available on the majority of the Sanchez Road, and this hinders widening and realignment. The Sanchez Road has a minimum 20-foot width with 2-foot shoulders. The width of this rural collector allows 400 Average Daily Traffic Units with a speed limit of 40 mph. [Graham County Engineer, 1992]

Graham County plans to extend the pavement on the Sanchez Road at least as far as the proposed mine entrance (approximately 1 mile of new pavement). This paving is planned for 1992, provided that the Sanchez Copper Project proceeds as scheduled. All unpaved roads in the project area associated with the operation will have dust suppression by means of water or chemicals.

Emergency and health/safety vehicles will use the existing paved roads and existing bridges to respond to emergency situations associated with the operation.

Traffic projections for the operation are listed in Table 2-2.

4.0 Environmental Consequences

The environmental consequences of the proposed action and reasonable alternatives will be discussed by resource, using the following assumptions:

1. The proposed action and reasonable alternatives will be fully funded and staffed.
2. Existing federal, state and local environmental standards are adequate for protection of the environment.
3. Short-term impacts are 5 years or less, and long-term impacts involve 5+ years.
4. Impacts will be direct, unless otherwise stated.
5. Any mitigation measure will be real, committed and enforceable.
6. The time frame for this project is 20 years.
7. Adverse or beneficial impacts which are identified as "low" and "medium" are not considered significant impacts. "High" impacts are considered as significant impacts.
8. The following areas are defined as study areas for specific resources (Figure 4-1):
   - Project area;
   - Lone Star Mining District;
   - Gila Valley; and
   - Graham County and portions of Greenlee County within the BLM Safford District.
9. There are no conflicts with federal, state or local land use plans, policy or controls. The proposed action complies with the approved BLM Safford District Resource Management Plan and the City of Safford's Comprehensive Development Plan.

The environmental consequences of each resource are described in the following format:

4.x <u>RESOURCE</u>

4.x.1 Proposed Action

4.x.2 Alternatives

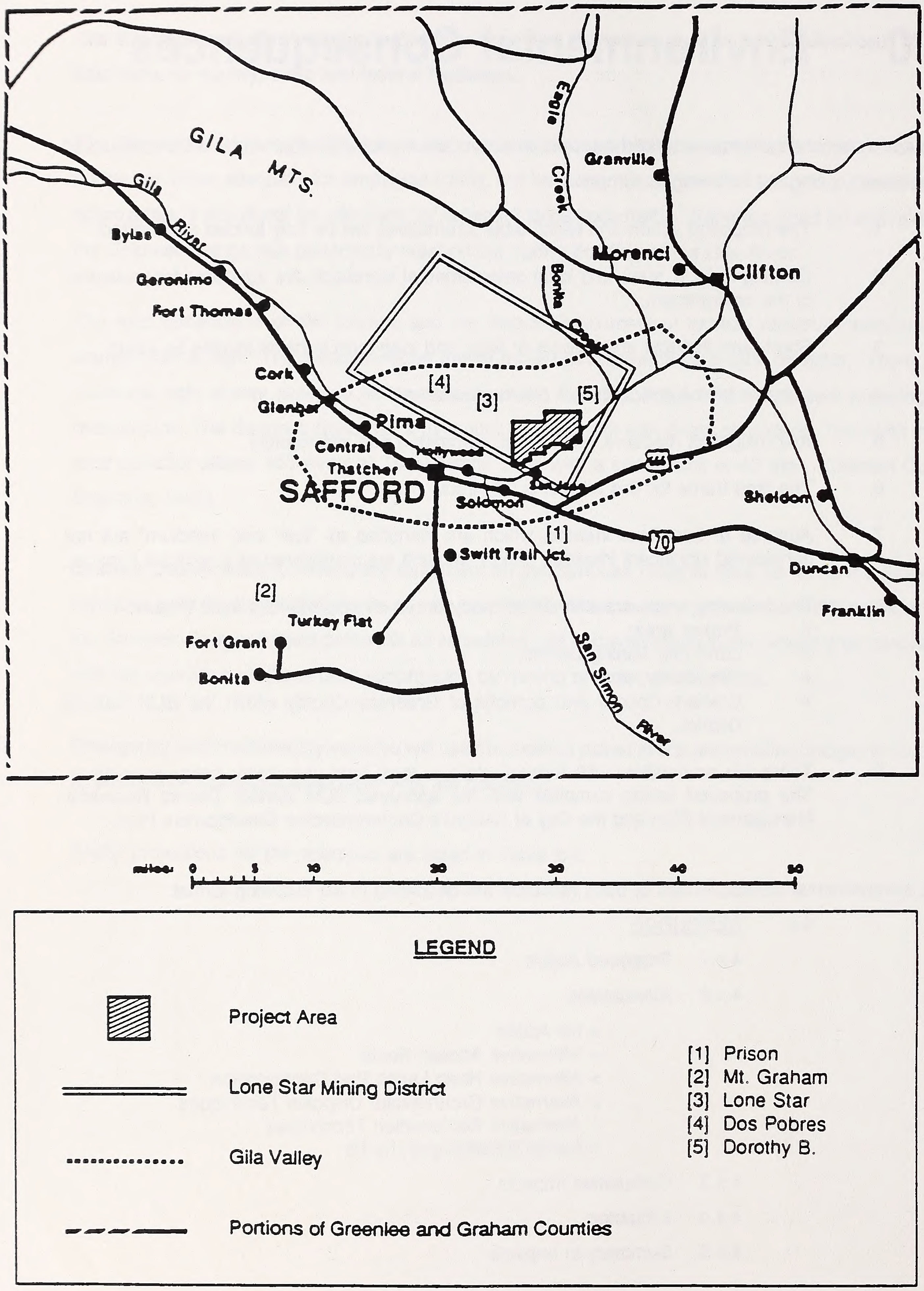
> No Action
> Alternative Access Route
> Alternative Heap Leach Pad Configuration
> Alternative Groundwater Disposal Techniques
> Alternative Reclamation Techniques
> Partial Backfilling of the Pit

4.x.3 Cumulative Impacts

4.x.4 Mitigation

4.x.5 Summary of Impacts

FIGURE 4-1
RESOURCE STUDY AREAS



Cumulative impacts are the impacts on the environment which result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Activities which were identified for inclusion in the cumulative impact section along with the proposed action are:

- Dorothy B. Placer Mine on Bonita Creek;
- Phelps Dodge Lone Star Deposit;
- Phelps Dodge Dos Pobres Deposit;
- San Jose Prison Expansion;
- Mt. Graham Astrophysical Area; and
- Closure of four landfills in the foothills of the Gila Mountains.

These activities have impacts on specific resources in the study areas but will not be considered for all resources. For example, development of the Dorothy B. Placer Mine would increase truck traffic on Sanchez Road; the Mt. Graham project will affect the socioeconomics of the Graham/Greenlee County areas, but will not be considered for habitat loss or water quality evaluations because of the significant distance between the projects. In the foreseeable future, it is assumed that Phelps Dodge will not develop more than one of its copper deposits.

4.1 Air Resources

4.1.1 Proposed Action

The Gila Valley was considered the study area for impact analysis of air quality. The Gila Valley is defined as 30 miles long and 15 miles wide.

Under the Proposed Action, the Sanchez Copper Project would mine copper ore using conventional open pit mining techniques and equipment. The ore would then be crushed at the edge of the pit and conveyed to a heap leach pad located west of the pit and adjacent to the Gila Mountains. Waste rock would be taken from the pit by trucks to a waste rock disposal site located immediately east of the pit. Two, much smaller waste dumps would be located just north of the pit. Access to the mine would be via the Sanchez county road.

The potential air quality impacts include increases in ambient concentrations of particulate matter (PM_{10}), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2), and volatile organic

compounds (VOC). The release of particulate matter is the primary concern because it has the potential to be released in the greatest amounts at the project site. A complete emissions inventory has been calculated for the proposed action and is presented in the "Air Quality Impact Analysis: Sanchez Mining Project" (EnecoTech, 1992). A summary of the calculated particulate emissions from each activity is shown in Table 4-1, "Particulate Emission Rates - Proposed Action." A summary of the calculated gaseous pollutant emissions is shown in Table 4-1A, "Gaseous Pollutant Emission Rates - Proposed Action."

There are many factors that influence a facility's air quality impact, including the pollutant emission rate, configuration of a pollutant source, prevailing winds, local terrain and the distance from a pollutant source to the nearest point of public access. The most important factor among these is the pollutant emission rate from a facility. The magnitude of the emission rate gives a good indication of the air quality impact of a facility. In general, the greater the emission rate, the greater the air quality impact.

The expected air quality impacts resulting from pollutant emissions can be quantified using Environmental Protection Agency (EPA) computer models. These air quality dispersion models are able to take into account all of the above factors, simulate the dispersion of a pollutant from its point of release and calculate the resulting downwind concentration. The expected ambient air quality impact of the Proposed Action has been calculated with EPA's Industrial Source Complex 2 (ISC2) models (Enecotech, 1992). The maximum air quality impacts resulting from operation at the Sanchez Copper Mine were calculated to be below the allowable Federal and Arizona ambient air quality standards, as shown in Table 4-2, "Summary of Maximum Pollutant Concentrations." Pollutant concentrations given in Table 4-2 include background concentrations of: 10 micrograms per cubic meter ($\mu g/m^3$) (NO_2 annual average); 15 $\mu g/m^3$ (PM_{10} annual average); 30 $\mu g/m^3$ (PM_{10} 24-hour average); 1,100 $\mu g/m^3$ (CO 1-hour and 8-hour average); and 20 $\mu g/m^3$ (SO_2 3-hour, 24-hour and annual average).

Table 4-1
PARTICULATE EMISSION RATES - PROPOSED ACTION
tons per year (tpy)

SOURCE DESCRIPTION	UNCONTROLLED PM_{10} EMISSIONS (tpy)	CONTROLLED PM_{10} EMISSIONS (tpy)	CONTROL EFFICIENCY (percent)
Pit, drilling	—	1.1	–
Pit, blasting ore/waste	22.4	22.4	–
Pit, loading ore/waste to haul truck	195.4	195.4	–
Pit, hauling ore to top of pit	206.8	62.0	70
Pit, hauling waste to top of pit	388.8	116.6	70
Waste dump, removing cover soil	1.2	1.2	–
Waste dump, unloading cover soil to stockpiles	0.8	0.8	–
Waste dump, cover soil replacement for reclamation	0.1	0.1	–
Waste dump, unloading waste	5.0	5.0	–
Waste dump, dozer activity	4.4	4.4	–
Waste dump, wind erosion of cover soil piles	0.5	0.5	–
Crushing plant, truck dump to hopper	3.0	0.2	95
Crushing plant, primary crusher	54.0	2.7	95
Crushing plant, secondary crusher	84.0	4.2	95
Ore stockpile, overhead conveyor belt transfer point	2.1	2.1	–
Ore stockpile, wind erosion	0.1	0.1	–
Plant conveyor to overland conveyor (first transfer point)	3.0	0.2	95
Overland conveyor, second transfer point	3.0	1.5	50
Overland conveyor, third transfer point	3.0	1.5	50
Overland conveyor, fourth transfer point	3.0	1.5	50
Shuttle conveyor system, leach pad	18.0	9.0	50
Hauling waste, top of pit to waste dump	248.4	37.3	85
Hauling ore, top of pit to crushing hopper	14.9	2.2	85
(2) Road graders	2.5	0.5	80
(15) Support vehicles	24.6	4.7	80
Combustion sources, 250 hp boiler	0.7	0.7	–
(2) Rotary drills	1.2	1.2	–
(17) Haul trucks	15.4	15.4	–
(2) Water trucks	1.5	1.5	–
(2) Hydraulic loaders	1.3	1.3	–
(2) Track dozers	1.2	1.2	–
Wheeled dozer	0.6	0.6	–
(2) Graders	0.2	0.2	–
(15) Support vehicles	0.1	0.1	–
TOTAL EMISSIONS:	1311.2	499.4	

TABLE 4-1A
GASEOUS POLLUTANT EMISSION RATES - PROPOSED ACTION
tons per year (tpy)

POLLUTANT SOURCE	EMISSIONS (tpy)			
	CO	NO_x	SO_2	VOC
Rotary Drill	2.5	9.2	2.5	0.9
Haul Trucks	108.1	251.1	27.4	11.6
Water Trucks	10.5	24.3	2.7	1.1
Hydraulic Loader	4.2	13.8	1.3	1.8
Track Dozer	2.5	9.2	2.5	0.9
Wheeled Dozer	6.5	15.2	1.3	0.7
Graders	0.6	2.6	0.3	0.1
Support Vehicles	31.0	0.7	0.04	1.0
TOTAL EMISSIONS:	166.0	326.1	38.1	18.2

TABLE 4-2
SUMMARY OF MAXIMUM POLLUTANT CONCENTRATIONS
(Including Background Concentrations)

Pollutant	Averaging Time	Max. Predicted Concentration Off-Site ($\mu g/m^3$)	Max. Predicted Concentration Closest Residence[a] ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)	Arizona Standard ($\mu g/m^3$)
NO_2	Annual	50.8	21.4	100	100
PM_{10}	Annual	33.5	16.2	50	---
PM_{10}	24-Hour	135.3	86.3	150	---
CO	1-Hour	1338.3	1299.8	40000	40000
CO	8-Hour	1231.6	1169.4	10000	10000
SO_2	3-Hour	87.1	61.6	1300	1300
SO_2	24-Hour	34.7	25.9	365	365
SO_2	Annual	23.7	20.3	80	80

(a) Model receptors were placed at two residences located south of the property boundary

All the maximum concentrations predicted by the dispersion models occurred along the project property boundary. The annual PM_{10}, NO_2, SO_2, and 8-hour CO occurred along the northern property boundary, northwest of the open pit. The 24-hour maximum PM_{10} concentration occurred north of the open pit, and the 1-hour CO concentration was south of the pit. The maximum 3-hour and 24-hour SO_2 concentrations were located north of the leach pad.

In addition to the Federal and Arizona ambient air quality standards, a source must meet the Class II Prevention of Significant Deterioration (PSD) increments if it is classified a major stationary source or if a complete major source PSD application has been submitted in the baseline area. Since neither of the above conditions are met, the Sanchez Copper Project is not required to meet the Class II PSD increments.

A Class I PSD area is defined as an area of special national or regional value from a natural, scenic, recreational, or historic perspective (EPA, 1990). Class I PSD increments are very protective of air quality in these areas. There are three Class I PSD areas located within 100 Km of the mine and include Galiuro Wilderness Area (71 Km), Chiricahua National Forest (86 Km), and Chiricahua National Monument (97 Km). These Class I areas were all included in the air quality analysis completed by EnecoTech, and the findings show that the impact from the mine on the Class I areas will be negligible.

4.1.2 Alternatives

No Action

Under the No Action alternative no further mineral development would be allowed and as a result, no air pollutants would be emitted from mining operations. The No Action alternative serves as a baseline from which other air quality impacts may be compared. Table 3-3 gives ambient background levels of air pollutant concentrations.

Alternative Access Route

From an air quality standpoint, there would be less fugitive dust, because Sanchez Road would be paved to the project site, and the gravel access road would be less than one mile in length. Because either route would be paved to the edge of the project boundary and both gravel roads will be treated for dust suppression, little airborne dust would result from travel on either route. Air quality impacts would be low.

Alternative Heap Leach Pad Configuration

The two alternative configurations of the final heap leach pad would have the same potential as the proposed action to add fugitive dust to the environment.

Alternative Groundwater Disposal Techniques

The groundwater disposal options will have a low impact on air quality.

Alternative Reclamation Techniques

Revegetation of the side slopes of the heap leach pad and waste rock dump will reduce air pollutants. This alternative would have a low, beneficial impact on air quality.

Partial Backfilling of the Pit

Partial backfilling of the pit would result in increased fugitive dust and increased vehicle emissions.

4.1.3 Cumulative Impacts

The Gila Valley is considered the frame of reference for evaluating cumulative impacts to air resources. The impacts include production of particulate pollutants associated with agricultural activities. The extensive networks of dirt and gravel roads in the valley influence impacts on particulate air quality of the area. The lack of major industrial sources results in little local contribution to CO, SO_2 and NO_x concentrations. The development of the Sanchez mine and other mining projects in the area, such as the Lone Star Project, would contribute to both particulate and chemical air pollution in the valley.

The federal Clean Air Act allows for development of projects which incrementally degrade air quality in an attainment area on a "first come" basis. If a new project, such as Lone Star, would exceed a designated increment, it must first reduce similar polluting sources to provide for its incremental increase prior to issuance of the DEQ Air Quality permit. In other words, a new project cannot produce a pollutant if its production will cause an exceedence of the air quality standard for that pollutant. EPA-approved pollution dispersion modeling of the Sanchez mine operation indicates that all federal and state air quality standards will be met. Thus, the maximum ambient impacts given in Table 4-1 represent cumulative impacts. Adherence to State and Federal Air Quality laws precludes significant cumulative deterioration of the air quality in the area.

4.1.4 Mitigation

The mitigation program in the proposed action is to use water and chemicals on the haul road to suppress dust. Dust will be controlled on the crushers and conveyors with water spray bars and pneumatic foggers. No additional mitigation is proposed.

4.1.5 Summary of Impacts

The air quality impacts identified are low to medium, long-term impacts. The analysis of the data indicates that there are no cumulative or significant adverse impacts to air quality.

4.2 Geology and Mineral Resources

4.2.1 Proposed Action

The Lone Star Mining District was defined as the study area for geology and mineral resources. The district is approximately 4 miles wide and 10 miles long.

The proposed action will remove approximately 200 million tons of waste rock and 200 million tons of ore. The pit will be 1,200 feet deep and approximately 4,000 feet in diameter. The proposed action would create conditions which may potentially be affected by geologic hazards. The geologic hazards evaluated include slope stability and seismic events. Potential slope failure in the mine, waste rock dump and heap leach have been evaluated. Using conservative design parameters and quality control during construction and operations, the failure potential should be minimized [Call & Nicholas, 1989].

The ore deposit will be removed and heap leached, with the ore recovery at 85% to 90%. The open pit may have additional economic copper reserves if the price of copper increases dramatically or if new recovery technologies are developed in the future.

The open pit will be left in a stable condition, but the pit will not be backfilled. This will create a significant, long-term, adverse impact.

4.2.2 Alternatives

<u>No Action</u>

Under the No Action Alternative, the project would not be developed.

Partial Backfilling of the Pit

Partial backfilling of the pit would result in potential, economic ore reserves being buried.

Other Alternatives

The alternatives would not change the effects to geologic or mineral resources which would occur under the Proposed Action.

4.2.3 Cumulative Impacts

The Lone Star Mining District is considered the frame of reference for evaluating cumulative impacts to geology and mineral resources. Past mining exploration and operations have been developed at a number of locations including Sanchez, Dos Pobres, San Juan, Dorothy B and Lone Star. These activities have utilized only a small fraction of the proven deposits of the district. No major open pit operations have been previously initiated in this mining district. Current mining activity in the district is limited to exploration. No significant production of copper or other minerals is currently taking place. The development of AZCO's Sanchez mine and Phelps Dodge's Lone Star deposit would result in two large open pits and development of approximately 1.2 billion tons of ore. This is a significant percentage of the proven deposits of this mining district. The impacts of the proposed action combined with past activities and the foreseeable development of the Lone Star deposit will result in significant development impacts to the mineral resources and the creation of two large open pits.

4.2.4 Mitigation

No mitigation is proposed for the geology and mineral resources. However, earthen berms and barriers will be placed around the open pit, where necessary, to discourage access. Additionally, points of view and interpretive signs for tourists will be provided.

4.2.5 Summary of Impacts

Analysis of the data indicates that there would be a significant adverse impact to the environment in the form of a large, open pit mine, with the possibility of a second, large, open pit mine by PD. There would be a low beneficial impact to the socioeconomics of the valley in terms of increased tourist activities.

4.3 Water Resources

4.3.1 Groundwater

4.3.1.1 Proposed Action

The Gila Valley was considered as the area of study for groundwater evaluation. The valley was defined as 30 miles long and 15 miles wide.

Two major environmental concerns are the quality of water which might accumulate in the bottom of the pit from infiltration of groundwater and from precipitation, and the quality of groundwater under the waste dump due to precipitation or surface water infiltrating through the dump. The quality of water which may accumulate from time to time in the pit bottom is of concern primarily due to its potential effect on wildlife which might drink or contact it. The quality of groundwater under the waste rock dump is of concern since this water may find its way into the Gila River and/or the aquifer used locally for irrigation and domestic purposes. Both of these concerns are related to the acid generating/neutralizing capacity of the rock and the leachable constituents.

Once the pit intersects the saturated conglomerate, water will seep into the pit. This seepage can be sharply reduced or halted, if required, through the use of a screen of wells or emplacement of a cutoff wall south of the pit.

Based on available well records, there are no known wells completed in the Upper Gila Conglomerate aquifer within a one-mile radius of the site. The Upper Gila Conglomerate aquifer does have a vertical gradient and discharges to the floodplain alluvium. However, considering the small volume of water at the pit site, the removal of this water should not significantly impact the floodplain alluvium.

The Bedrock aquifer at the site will also be intersected by the mine pit. The Bedrock aquifer has limited quantities of water and should produce limited quantities of water in the pit. There are no known wells completed in the Bedrock aquifer in the immediate vicinity of the mine pit. The mine pit will cause limited impacts, if any, on the bedrock or overlying aquifers.

The proposed waste rock dump area is located in a small, open side drainage just east of the pit and one mile north of the Gila River. Two smaller waste rock sites are located just northwest of the pit (see Figure 2-2). Groundwater is present at approximately 100 to 150 feet below ground surface in this

area. The waste rock will consist of barren alluvial, conglomeratic and volcanic overburden and highly oxidized non-ore interburden from the pit. Blast tests indicate the material will be comprised of relatively large rock fragments and should generate very little dust. Meteoric waters will be able to pass through readily, with reduced retention/reaction time.

Visual, microscopic and other studies indicate both the ore and the non-ore interburden contain very little relict sulfides from the original low sulfide content. On average, less than 0.10% (2 lb/ton) sulfide content is expected in the material from the pit, most of which occurs in the less permeable portions of the rock. Metallurgical tests performed on oxidized ore, non-ore and overburden demonstrate the material from the pit will consume and not generate acid.

A source of potential impacts from the waste dump is that of increased turbidity and sediment load from and around the waste dump. Sediment ponds will be constructed at the north and south ends of the primary waste rock dump to collect sediment that may be generated by the waste dump or disturbed areas.

Another area of the proposed operation with the potential to impact the hydrologic system is the heap leach and solution ponds. Crushed copper ore will be stacked on prepared pads and treated with dilute solutions containing sulfuric acid, presenting the potential for leakage of metal-containing acid solutions into the environment.

The proposed heap leach pad site for treatment of ore is located on range front terraces west of the pit. The southern edge of the proposed pad is more than a mile and a half north of the Gila River. The heap will be built on an essentially impermeable (10^{-7} cm/sec) clay-lined pad. The pad and ponds will be built to equal the best available demonstrated control technology (BADCT) with adequate leak detection systems, and will require approval by Arizona DEQ.

The pad surface will be prepared by clearing, grubbing, and grading the soil foundation. The soil surface will then be compacted to create an underliner. A 12-inch compacted clay liner, with a minimum permeability of 10^{-7} cm/sec, will be installed over the compacted soil foundation. The processing solutions will be weakly acidic (2 to 5 grams per liter sulfuric acid).

Solutions will be directed through a system of sub-heap channels to composite-lined, perimeter channels which will direct solutions into solution storage ponds. These ponds and the overflow containment pond will have double liners with leak detection systems, to prevent any loss of solution to the environment. Pond designs include double-HDPE geomembrane liners; a 60-mil layer over a

40-mil layer, separated by a geotextile drainage net. The ponds are designed to contain a simultaneous 100-year, 24-hour storm and 24-hour draindown. Diversion ditches above and around the heap and solution ponds channel runoff past these facilities and back into the natural drainage system to prevent increased turbidity and sediment load from the heap/ponds complex (Figure 2-2).

Several state and federal water quality permits are required before the project can begin operations. An Aquifer Protection Permit (APP) is required by the Arizona Department of Environmental Quality (ADEQ). A Section 404 (Clean Water Act) Permit is required by the US Army Corps of Engineers (COE). If the project were to discharge water, a National Pollutant Discharge Elimination System (NPDES) Permit would be required by the US Environmental Protection Agency (EPA). An EPA-administered Storm Water Permit will be required for non-point source runoff from disturbed areas. Appendix F describes these permits in more detail.

4.3.1.2 Alternatives

<u>No Action</u>

The No Action alternative would have no impact on groundwater. There would be no change in groundwater quality or quantity.

<u>Alternative Access Route</u>

The alternative access route options will have a low impact on groundwater.

<u>Alternative Heap Leach Pad Configuration</u>

The two alternative heap leach pad configurations are in essentially the same location as the proposed action. The liners, leak detection systems, and monitoring would be designed to the same standards. Impacts to the quantity and quality of groundwater would be the same as the proposed action.

<u>Alternative Groundwater Disposal Techniques</u>

Option 1 would have a low impact on groundwater, since the quality and quantity of the groundwater to be used for irrigation would be similar to the groundwater in the upper aquifer.

Option 2 would have a low to medium impact on the Lower Gila Conglomerate aquifer associated with the Gila Conglomerate. The quality of the water is assumed to be poor, and the only Arizona DEQ approved method for disposal would be reinjection to the aquifer from which it was intercepted.

Alternative Reclamation Techniques

Revegetation of the sideslopes of the heap leach pad and waste rock dump would have a low, beneficial impact on groundwater. The revegetated slopes would further reduce the opportunity for runoff to penetrate deep enough to affect the groundwater of the project site.

Partial Backfilling of the Pit

The alternative of partial backfilling of the pit is a method of preventing water accumulation in the bottom of the open pit following abandonment. Calculations provided by GSi/water [1992] estimate that groundwater inflow from the Upper Gila Conglomerate and Bedrock aquifers following mining cessation would be up to 170 gpm and 250 gpm, respectively. Additionally, GSi calculates that approximately 710 gpm ($5x10^7$ ft^3/yr) net precipitation/evaporation outflow is anticipated from the mine pit. As such, ponding would only occur ephemerally in the pit, in response to significant precipitation events.

Utilizing these calculations, it could be predicted that inflow to the pit from the Bedrock aquifer and Upper Gila Conglomerate and associated Upper Gila aquifers could continue at an estimated 170 gpm and 250 gpm perpetually. Partially backfilling the pit would decrease the evaporation potential from the Bedrock aquifer; however, almost complete backfilling of the pit would be necessary to minimize inflow from the Upper Gila Conglomerate and Upper Gila aquifers.

4.3.1.3 Cumulative Impacts

The Gila Valley is considered the frame of reference for evaluating cumulative impacts to groundwater. Impacts to the quantity and quality of the available water commenced with the settlement of the valley in the nineteenth century. Today approximately 130,000 acre feet of groundwater are used annually for irrigation, industrial and residential purposes (See Section 3.3.1). The proposed action would utilize approximately 2,600 acre feet of groundwater annually (See Section 2.1.8.2). Data on water usage in the potential Lone Star project is unavailable. If we consider the size of this project equivalent to Phelps Dodge's Morenci operation, 7,000 to 8,000 acre feet of water could be used annually (See Section 3.3.1). Therefore, additional utilization of groundwater would be approximately 10,000 acre feet per year. This represents an increase of about 7.7% over current usage. Under Arizona State Law, the Gila Valley is an open basin for groundwater use and development, and the additional use of groundwater for these mining projects is not considered a significant impact.

Cumulative impacts to groundwater quality in the Gila Valley from past and current human activities are not well documented. The proposed action will comply with Arizona State Law and will use Best

Available Demonstrated Control Technology (BADCT) methods in development and operation of the Sanchez mine. Presumably, development of future projects, such as Lone Star, will follow similar laws. The BADCT standards for mining operations are designed to prevent degradation of groundwater aquifers. With this in mind, the cumulative impacts to Gila Valley groundwater quality from the proposed action and any subsequent mining developments should be insignificant.

4.3.1.4 Mitigation

Interceptor wells and a cut-off wall have been recommended in the proposed action if groundwater from the Upper Gila aquifer appears to be seeping into the pit. No additional mitigation measures are proposed.

4.3.1.5 Summary of Impacts

Analysis of the data indicate that there are no cumulative or significant adverse impacts to groundwater.

4.3.2 Surface Water

4.3.2.1 Proposed Action

The Gila Valley was considered as the study area for analysis of surface water impacts. The valley is defined as 30 miles long and 15 miles wide.

Surface water runoff will be controlled by using a combination of diversion ditches and sedimentation ponds. Diversion ditches and/or sedimentation ponds will be installed around the mine pit, waste rock dump, and the leach pad. All the diversion ditches will be designed to divert the runoff from a 100-year, 24-hour storm. The diversion ditches will be rip-rapped where necessary to minimize erosion. Sedimentation ponds will be designed to contain the runoff from the 100-year, 24-hour storm.

A diversion ditch will be constructed above the mine pit. The watershed above the mine pit covers and area of approximately 500 acres. The ditch will collect runoff from the northwest side of the pit and

route the water along the west side of the pit. Discharged water will enter the lower portion of the small unnamed canyon west of the open pit.

At the waste rock dump, sedimentation ponds will be constructed at the north and south ends of the dump to collect sediment that may be generated by the dump or disturbed areas.

At the leach pad and solution ponds location, diversion ditches will be constructed above the pad and ponds. The diversion ditches will route runoff to existing drainage channels located to the east and west.

The pregnant leach solution (PLS) and recirculation ponds will be located down-gradient from the leach pad. To determine runoff storage requirements, a water balance was prepared covering a three year period. The rainfall during each year was assumed to be equal to the wettest year on record for Safford (17.41 inches). A 100-year 24-hour storm was assumed to occur in the middle of the second year. Total available capacity of the ponds will be 26.8 million gallons during Phase 1 of the operation and 66 million gallons for Phases 2 and 3. (Section 2.1.6.2).

Impacts to the quantity of surface water from the proposed action should be low to medium. Diversion ditches will reroute the runoff, but the ditches will not retain the water. Runoff will reach the Gila River and not reduce river flows. Direct precipitation on the leach pad and solution ponds will be entrained into the process and removed from the Gila River system. However, the leach pad and solution ponds cover a very limited area which represents a very small portion of the Gila River drainage basin. Impacts to flows in the Gila River should be negligible. Direct precipitation collecting in the mine pit will be pumped out and used in the processing operation.

There may be short-term increases in sediment loads during construction of the facilities and at the start of operations. Sediment increases should be minor due to the limited amounts of precipitation. Impacts to surface water quality will be low. As discussed in Section 4.3.1.1, the waste rock has a minor sulfide content which minimizes the potential for acid generation and metal leaching. Runoff or discharges from the waste dump or mine pit should not have increased metal concentrations in surface water. As discussed previously, the leach pad and solution ponds will be lined to prevent leakage and impacts to surface water. There is an overflow pond downstream of the solution ponds to collect any excess fluids that may overflow the ponds due to power failures or storm events. The impact to surface water would be low to medium, and long term.

4.3.2.2 Alternatives

No Action

The No Action alternative would eliminate impacts to surface water.

Alternative Access Route

The alternative access route would slightly increase the sediment load of surface water runoff during construction. After the road is paved and culverts are installed, the natural runoff sediment load will stabilize. Impacts to surface water would be low and short term.

Alternative Heap Leach Pad Configurations

Impacts to surface water would be the same as the proposed action.

Alternative Groundwater Disposal Techniques

The two options would have low to medium impacts on surface water.

Alternative Reclamation Techniques

The reclamation of sideslopes would further reduce sedimentation of surface water, thus providing a low, beneficial impact.

Partial Backfilling of the Pit

Impacts to surface water would be the same as the proposed action.

4.3.2.3 Cumulative Impacts

The Gila Valley was used for the frame of reference to evaluate cumulative impacts to surface water. The settlement of the Gila Valley led to major impacts on the quantity and quality of surface water in the valley. Historic mining operations and associated spills have also impacted these surface waters. Current mining activities utilize no surface water and contribute little in the way of water pollution. The Dorothy B. Placer Mine has disturbed about 45 acres and may contribute small quantities of sediment to the Gila River.

The proposed action will disturb about 1,400 acres, and even with mitigation measures in place, may contribute sediment to the Gila River during periods of high precipitation. The Sanchez mine design

requirements make spills of toxic solutions into the river an unlikely event. The same design requirements apply to the Lone Star mine which is located much farther from the river. The development of the Lone Star mine may disturb approximately 15,000 acres and add more sediment to the river. The combination of all these historic, current and foreseeable impacts have significantly impacted the quantity and quality of surface water in the Gila River. The Sanchez mine is expected to have no effect on the quantity and minimal effect on quality of water in the Gila River.

4.3.2.4 Mitigation

The proposed action includes mitigation to control surface water degradation. Diversion ditches will route runoff around disturbed sites. Rip-rap will be used in the diversion ditches as necessary to slow runoff velocities and decrease erosion. Water collected from disturbed areas will be collected in sedimentation control ponds.

Further mitigation of the routed runoff water is possible by assuring that the water entering the original drainages will be on the same stream gradient, or energy reducers will be installed to slow the velocity of the runoff water.

4.3.2.5 Summary of Impacts

Analysis of the data indicates that there are no significant adverse impacts to the surface water quality or quantity. In the foreseeable future, the PD Lone Star project would have cumulative impacts on surface water when added to the Dorothy B. Placer Mine and Sanchez Copper Project.

4.4 Soils

4.4.1 Proposed Action

The study area for soils was the project area. For cumulative impacts, the Gila Valley was studied.

This action would result in the disturbance of 1,400 acres of soil. Impacts to soil would include soil loss due to inefficient salvage, erosional losses, destruction of natural soil profiles, and reduction in natural biological activity. Reclamation activities will reestablish soil on 765 acres of disturbance. The mine pit (277 acres), the heap slopes (265 acres) and the dump slopes (72 acres) will not be reclaimed. In addition, some haul road fill and the sedimentation ponds (21 acres) will not be reclaimed. Thus, there will be a 635-acre loss of soil habitat and its natural productivity.

The control of soil erosion will be important during operation and final reclamation. Soil erosion by wind and water may deteriorate air and water quality and contribute to the difficulty of revegetation. Erosion control measures will be implemented to reduce soil loss due to wind and water. Soil stockpiles will be located in topographic sites that protect them from water and wind erosion. Furthermore, they will be revegetated with native perennial grasses.

Soil salvage and replacement on the areas to be revegetated will be at a depth of three to six inches. Soil can be salvaged from all areas to be affected by operations, with the exception of the rocky hillside in the waste rock dump area. The steepness (1.88 to 1), rock, and rock outcrop make soil salvage in this area impractical.

Soil materials will be immediately vegetated and mulched once they are placed on the heap leach pads, waste rock or other sites to be reclaimed.

Unavoidable impacts to soil will be mitigated by reclamation and resource management. Provided that reclamation is successful, long-term impact to soils will be low. Once vegetation is successfully established, the nutrient cycling ability of the soil will enhance soil productivity and the soil forming processes will re-establish soil profiles.

4.4.2 Alternatives

No Action

Under the No Action alternative, no further mineral development would be allowed, and as a result, no further soil loss could be attributed to mining.

Alternative Access Route

If the alternative access route (utilizing only the Sanchez Road) were selected, three miles of gravel road (Solomon Pass Road) and 4 miles of dirt road would not require upgrading, thereby eliminating disturbance to approximately 19 acres.

Alternative Heap Leach Pad Configurations

The acreage of soil impact for this alternative will depend on the final configuration and design. The two-pad alternative would result in the disturbance of approximately 100 acres more than the single pad.

Alternative Groundwater Disposal Techniques

None of the options for groundwater disposal will impact soil resources.

Alternative Reclamation Techniques

This alternative would require the grading of the heap leach side slopes to 3:1, and an additional 134 acres would be covered with three to six inches of coversoil and revegetated. Approximately 50 acres of the north side of the waste rock dump would be covered with three to six inches of coversoil and revegetated. The pit (277 acres) and part of the waste rock dump (72 acres) would not receive coversoil. Revegetation of side slopes would provide a low to medium beneficial impact for soil and erosion control in the long term.

In order to grade the sideslopes, an additional 100 - 200 acres would be adversely affected. The soil and vegetation would be stripped from the unaffected areas to allow for the sideslopes to be graded to a flatter slope. This would partially offset the beneficial impact of revegetating the sideslopes.

Partial Backfilling of the Pit

Partial backfilling of the pit would not noticeably change the number of acres reclaimed.

4.4.3 Cumulative Impacts

The Gila Valley is the area considered in evaluating cumulative impacts to soils. Historically, soil disturbance and loss in the valley was due to agricultural activities and range management practices. Agricultural activities continue to expose many square miles of soil to wind and water erosion. Past mining activities in the area have disturbed unknown quantities of soil at many sites in the valley. The Dos Pobres, San Juan, Lone Star, Dorothy B and other smaller operations in remote locations disturbed soil during exploration and production activities.

The proposed action will temporarily disturb approximately 1,400 acres of soil. After reclamation, approximately 635 acres will remain in a disturbed condition. Measures in the reclamation and closure plan are designed to minimize long-term erosion problems on the unreclaimed areas. The future development of the Lone Star mine, expansion of the prison at San Jose, and reclamation activities at the Dorothy B mine could lead to a net long-term disturbance of an additional 6,500 acres of soil. This represents a significant impact to soils in the Gila Valley. Less than 10% of this impact can be attributed to the Sanchez mine.

4.4.4 Mitigation

The proposed action mitigation measures include salvage of all available coversoil, protection of coversoil stockpiles, redistribution of coversoil on all areas to be revegetated, and revegetation. No other mitigation measures are proposed beyond those presented in the reclamation plan as described in Section 2.1.9.

4.4.5 Summary of Impacts

Analysis of the data indicates that there are no significant adverse impacts to soil from the proposed action. The cumulative impacts to soil will not be significant in the long term, because mitigation in the form of reclamation will substantially reduce the impact. No time table or reclamation plan is available for the PD Lone Star project.

4.5 Vegetation

4.5.1 Proposed Action

The study area for vegetation is the project area. For cumulative impacts, the Gila Valley was studied.

The proposed action will impact 1,400 acres of the Sonoran desert scrub association. Impacts to vegetation are summarized in Table 4-3 by proposed activity and vegetation type. Impacts per vegetation type are as follows: upland 729 acres, terrace 645 acres, and desert wash 26 acres. The 277 acres of upland, terrace and desert wash vegetation at the open pit site are highly disturbed from past mining activities.

Revegetation of the heap leach pads, waste dumps and all other disturbances, except the open pit, will be used to mitigate the vegetation impact. Thus, there will be a permanent loss of 635 acres of natural vegetation and a temporary loss of natural production from an additional 765 acres of vegetation for

a period of time until revegetation. Seed mixtures will be developed through consultation with the BLM. Revegetation test plots will be developed over the life of the mine.

The proposed action would not impact any known populations of threatened or endangered plant species or impact wetlands.

Table 4-3
VEGETATION IMPACTS
PER VEGETATION TYPE

(Acres of Vegetation Type)

Proposed Activity	Upland	Terrace	Desert Wash	Total
Open pit	190	81	6	277
Waste dump	287	184	16	487
Heap leach pads	115	367	2	484
Ponds	19	-	1	20
Roads	16	13	1	30
Facilities, etc.	102	-	-	102
Total	729	645	26	1400

4.5.2 Alternatives

No Action

Under the No Action alternative, there would be no additional impacts to vegetation.

Alternative Access Route

The alternative of using only the Sanchez Road would avoid impacts to approximately 19 acres of the desert scrub association.

Alternative Heap Leach Pad Configurations

This alternative would impact the desert scrub association including terraces, upland, and the desert wash types, and would affect approximately 100 more acres than the proposed action.

Alternative Groundwater Disposal Techniques

These alternatives would not require a dam and reservoir, and therefore would have less impact on vegetation.

Alternative Reclamation Techniques

The reclamation alternative will increase vegetation by 134 acres on the heap leach sideslopes and by 50 acres on the north slopes of the waste rock dump. This would be a medium, beneficial impact for vegetation in the long term.

Partial Backfilling of the Pit

Partial backfilling of the pit would not substantially change the impacts to vegetation.

4.5.3 Cumulative Impacts

Cumulative impacts to vegetation are evaluated in the context of the Gila Valley. During the nineteenth and early twentieth centuries, the settlement of the valley resulted in the modification or destruction of many square miles of native vegetation. Historic mining activities in the valley may have directly disturbed hundred to a few thousand acres. Approximately 45 acres of disturbance exists at the Dorothy B. placer mine. About 160 acres can be expected to be disturbed by the prison expansion at San Jose.

The proposed action is expected to disturb a total of 1,400 acres of native vegetation. Approximately 245 acres of this is already in a highly disturbed state due to ongoing mining activities at the site. If the Lone Star mine is developed, an additional 15,000 acres of vegetation could be disturbed or destroyed. Reclamation activities associated with the Dorothy B. mine and the closure of several landfills on public lands could result in beneficial impacts to 115 acres of vegetation. Residual impacts to vegetation from the three mines, landfill and prison projects could be as high as 7,000 acres after reclamation. The cumulative impacts to vegetation from agriculture, urban development and mining activities are significant. However, mining has played a relatively insignificant role. Less than 10% of foreseeable impacts can be attributed to the Sanchez mine.

4.5.4 Mitigation

The reclamation plan in the proposed action constitutes the mitigation program for the Sanchez Copper Project. This includes a salvaging program for state protected species and transplanting other plants on site for later use in reclamation. The salvaging program will be coordinated with the Arizona Department of Agriculture, as required by State law. No other mitigation is proposed.

4.5.5 . Summary of Impacts

The long-term impacts to vegetation from the Sanchez Copper Project will be partially mitigated through the reclamation program. There will be significant, short-term impacts to 1,400 acres. Adherence to

strict BLM requirements for reclamation will prevent cumulative or significant long-term adverse impacts to 765 acres of vegetation; however, there will be significant, long-term impacts to 635 acres of the project site which will not be revegetated.

4.6 Wildlife

4.6.1 Proposed Action

The study area for wildlife is the Gila Valley, which has been defined as 30 miles long and 15 miles wide.

The most biologically significant impact resulting from implementation of the proposed action is the long-term loss of 1,400 acres of undisturbed and disturbed wildlife habitats. Some habitats, such as mine tunnels and rock outcrops, will be permanently lost, while most others will be at least partially reclaimed to former productivity in the decades following mining. Impacts to desert washes, which are the most valuable habitat on site from a wildlife numbers and diversity perspective, have been greatly minimized through sensitive facilities siting.

Wildlife inhabiting the area disturbed by mining will be killed by construction activities (slower, less mobile wildlife, such as most herpetofauna and small mammals) or displaced to adjacent habitats. There would also be additional road kills from the increased traffic. The local, long-term loss of forage and prey species on the project area will displace local big game and predators from this former portion of their home ranges. Impacts resulting from this habitat loss, wildlife mortality and displacement will be locally severe, but biologically insignificant when the large area of similar, undisturbed surrounding habitats is considered.

A moderately-sized maternal colony of California leaf-nosed bats and cave myotis, the most sensitive wildlife species on the project area, was displaced to adjacent habitat where they may be accommodated without adverse affect. Flushing bats from the mine tunnels and sealing the adits at an appropriate time of year (January) minimized any direct impacts to this and other roosting bat species.

Other high-interest wildlife species, such as javelina, mule deer, and game birds, will be adversely impacted by habitat loss, displacement and increased human activity in the area. Bingham (1991) estimated that approximately one-half of the home range of a javelina herd will be lost to the waste rock dump at full buildout. Assuming the javelina range capacity is full, this would result in a long-term, 50%

reduction in the size of the herd. It is also likely that hunting pressure will increase in the surrounding area, affecting all game and some nongame species.

Rerouted surface water flows through washes, as a result of upstream diversions around mine facilities, will probably not adversely affect the survival of established vegetation of the dependent wildlife. Narrow bands of similar wash vegetation will eventually develop along portions of the diversion ditches above their confluence with the washes.

Contamination of the Gila River and aquatic biota by process solutions is unlikely because the solution ponds will be lined, the impoundments will be properly sized and engineered, and the Gila River is one mile below the project area, buffered by desert habitat and agricultural fields.

The mine pit is anticipated to intercept the groundwater table resulting in an anticipated inflow rate of 200-500 gpm. Depending on the efficacy of intercepting the groundwater, its quantity and quality, and the method selected for its disposal, dewatering of the mine pit during operations could adversely or beneficially affect wildlife habitat along any drainage channels, ponds, or in agricultural fields along the former Gila River bottom.

Disposition of the final mine pit could have varying effects on wildlife. The final pit will be 1,200 feet deep. There will be a 100-foot-wide safety bench at the 3,300-foot level, and a 100-foot-wide haul road will spiral from the pit rim to the bottom of the pit. Pit benches may be attractive to raptors. If the pit partially fills with water, this site could benefit some local wildlife species, depending on water quality. Waterfowl will be attracted to this pond, and use will vary depending on water quality and the aquatic biota that develops in it. Water quality could also influence how suitable this isolated water body would be as a reintroduction site for one or more of the sensitive native fishes that are highly tolerant of poor water quality.

4.6.2 Alternatives

No Action

Under the No Action alternative, overall wildlife use of the project area would increase slightly as the 245 acres of unreclaimed habitat (Section 2.1.2), disturbed by past mining activities, gradually recovered. Low levels of hunting and other wildlife-oriented recreational activities would continue at intensities dictated by the interests and numbers of the local human population.

Alternative Access Route

The alternative access route (Sanchez Road) is an existing road. No additional impacts to wildlife would be incurred.

Alternative Heap Leach Pad Configurations

These alternatives will have the same impact as the proposed action.

Alternative Groundwater Disposal Techniques

The options for disposal of groundwater into the existing irrigation system or deep well injection would not impact wildlife.

Alternative Reclamation Techniques

Revegetation of additional land (sideslopes) may improve the habitat for some wildlife species, depending on the vegetation species incorporated. Some wildlife will prefer the steep, rocky sideslopes remaining on the waste rock dump. The low to medium, long term impact to wildlife will be a reestablishment of approximately 184 acres of vegetated habitat for use by wildlife.

Partial Backfilling of the Pit

Partial backfilling of the pit would result in approximately the same impact to wildlife as the proposed action.

4.6.3 Cumulative Impacts

The Gila Valley is the area considered for the evaluation of cumulative impacts to wildlife. Settlement of the Gila Valley has resulted in major losses of wildlife habitat. The vast majority of this loss is due to agricultural activities in the riparian and bottomland areas. Mining activities have impacted relatively small areas of desert scrub habitat and the populations of wildlife that this habitat supports. Historically, mining operations and associated spills contributed to reduced native fish populations in the Gila Valley. Current mining activities in the area have disturbed less than a few thousand acres of habitat, and mortalities have not been a problem.

The effects of the proposed action combined with the foreseeable development of the Lone Star mine, reclamation of the Dorothy B. mine and public landfills, and expansion of the prison could result in the long-term loss of 15,000 acres of desert scrub habitat. Residual losses of habitat after reclamation could run as high as 7,000 acres. Assuming that the habitat is at full carrying capacity, population

displacement and/or direct mortality may be a result of these projects. Since the quantity of desert scrub habitat loss to these projects is relatively low and it supports low populations of wildlife, there will be few direct mortalities, and the cumulative effects of these projects would not result in significant impacts to wildlife populations in the valley.

4.6.4 Mitigation

The proposed action's mitigation program includes the development of water sources (sedimentation ponds) for wildlife, and revegetation of lost habitat. AZCO will fund bat research in the area ($2,500) to help develop a better understanding of bat habitat.

The U.S. Fish and Wildlife Service, in a letter dated December 31, 1991, concurred that the man-made adits on the project site should be closed to restrict further use by bats. This had a significant, long-term impact on the California leaf-nosed bats (Macrotus californicus) and cave myotis (Myotis velifer) which have used the adits in the past. The adits were only used part of the year, and they would eventually be lost to the mining operation. The adverse impact will be mitigated by use of other man-made adits in the vicinity and by AZCO's provision of $2,500 for bat research in the area.

The Sanchez wildlife water system was built by BLM and the Arizona Game and Fish Department. It is located about one half mile from the north end of the proposed waste rock pile, which will be far enough to buffer impacts to wildlife that use the site. After discussions with Arizona Game and Fish Department personnel, BLM recommends that the water be left in place and that wildlife use be monitored by Arizona Game and Fish Department during the life of the mine. They will determine if wildlife use decreases significantly; if so, AZCO will mitigate by constructing a similar water source.

4.6.5 Summary of Impacts

Long-term loss of wildlife habitat will occur, but because of the poor condition of the areas to be disturbed, the impacts will be low to medium.

There is only a narrow terrace between the Gila Mountains and agricultural fields along the Gila River in the vicinity of the Sanchez Copper Project. Many desert species are unable to live in or travel through these other communities. Therefore, for the life of this project, some species will be blocked from their normal travel routes, and the exchange of genetic material of native plants will be restricted. This is not an important problem for the biological diversity of the affected plants and animals at the landscape, species, or generic levels. The 17-year life of the mine project is too short in relation to the life of any of the widely distributed species to affect its survival or genetic character.

When the mine site is rehabilitated, the habitat link will be reestablished, and the flow of individuals and genetic information will resume.

Analysis of the data indicates that through mitigation, there will be no cumulative or significant adverse impacts to wildlife.

4.7 Land Use

4.7.1 Proposed Action

The study area for this resource is the project area. For cumulative impacts, the Gila Valley was studied.

The proposed project is located on unpatented mining and millsite claims administered by the BLM pursuant to 43 CFR 3809, the BLM's regulations governing mining on public lands. The proposed action would not result in a change in the land status or ownership in the project area.

The principal land uses in the immediate area are cattle grazing, mineral exploration, and wildlife habitat. The area will gradually give way to mining, with cattle grazing being displaced. The wildlife habitat will change at the pit, waste rock dump and heap leach pads. The proposed action is in conformance with the Geronimo Management Framework Plan, approved August 3, 1973. This Management Framework Plan states that in the area where the mine would be located (Area 3), "Consider minerals the primary resource value; restrict other uses to avoid conflict, limit Bureau investment to fences and water development, which can be quickly amortized."

The proposed action would be consistent with the BLM's approved Safford District Resource Management Plan (RMP). The overall objective of minerals management in the Gila Resource Area is to maintain the public lands open for exploration and production of mineral resources, while mitigating impacts to wildlife, recreation and wilderness resources.

The proposed action will leave 277 acres of open pit which would be approximately 1,200 feet deep. This would be a permanent loss of grazing land. The pit could be used for wildlife or recreation, but the longer term quality and quantity of surface water in the pit is unknown.

The waste rock dump will increase the size of the hill on the east of the pit by approximately 480 acres. Once this area is reclaimed, it should have a similar appearance to the existing hill. The heap leach

pad will cover over 500 acres. The pad will be fenced during operations, but the fence will be removed after reclamation. The proposed use would be to reclaim the pad to blend with the surrounding benches and mesas, and reestablish grazing and wildlife habitat.

The project area will be partially fenced and posted to discourage the general public from using the area. There would be a loss of recreation in the form of hunting, hiking, horseback riding, rock hounding, or ORV use on 1,400 acres during the life of the project. Recreation use of the area will shift elsewhere, creating a low, long-term impact. Mine traffic will have a low impact on recreational traffic. The project will not impact wilderness areas or Areas of Critical Environmental Concern (ACECs).

Mine development will result in a long-term impact to the project area until productivity has recovered following reclamation. This loss, however, is relatively low. Considering the size of the area to be disturbed, the 245 acres already disturbed, and the low carrying capacity, at most eight cows will be displaced per year for the life of the project and reclamation. However, impacts to the two overlapping allotments also include the practical difficulty of moving stock around the mine to other portions of the allotments. Reclamation efforts will focus on replacing lost forage values which will enhance future range productivity for livestock and wildlife.

4.7.2 Alternatives

No Action

Under the No Action alternative, the present land uses and values would be unchanged.

Alternative Access Route

The alternative access route is an existing road. Utilization of this road would not change the land use of the area.

Alternative Heap Leach Pad Configurations

The alternative pad configurations will alter land use and grazing in essentially the same manner as the proposed action. The alternative pad configurations will not impact wilderness, Areas of Critical Environmental Concern, or the Gila Box Riparian National Conservation Area.

Alternative Groundwater Disposal Techniques

There will not be any additional impacts to land use from the groundwater disposal alternatives.

Alternative Reclamation Techniques

The reclamation of additional land will not change the overall land use of the project area, as compared with the proposed action.

Partial Backfilling of the Pit

Partial backfilling of the pit would not substantially change the future land use of the pit.

4.7.3 Cumulative Impacts

Combined impacts of the existing projects and those in the foreseeable future will not have a significant cumulative impact on the Gila Valley land use character. A review of the data and consultation with Graham County officials indicates that the project will not have an adverse cumulative impact on land use.

4.7.4 Mitigation

The proposed action is consistent with BLM's land use plans (Geronimo Management Framework Plan and Safford District Resource Management Plan). The overall management program for the Sanchez area is "multiple use." As mitigation for the mine development, BLM will require the following items to avoid conflicts with other multiple uses:

1. Fencing - Fences will be constructed to keep cattle and other large animals away from the heap leach pads, ponds, and processing facilities;

2. Signs - Warning signs will be posted at the access road entrances (project boundary) of the processing facility and mine to advise the public of potential health and safety dangers associated with the project. Signs and fencing will also be maintained during the life of the project on the north side of the pit.

3. Grazing - The Lone Star Allotment grazing capacity will not be affected. The Sanchez Allotment is authorized for 14 cows year round. Mine development will basically destroy this allotment; lands not being impacted are steep and lack water, rendering them useless for grazing. Where compensation is concerned, the BLM does not place a value on permits or leases; therefore, if compensation is warranted, the issue should be between the permittee and the mine developer. If and when mining activities reach the limits of the proposed land use, it is recommended that the permit be cancelled in total.

4.7.5 Summary of Impacts

The proposed action will have a significant, adverse impact on 277 acres (open pit) plus 358 acres (unreclaimed sideslopes) of public lands as a result of the proposed action. The other long-term impacts will be mitigated by reclamation.

In the foreseeable future, the Phelps Dodge Lone Star project could have a moderate adverse impact on land use loss in the Gila Valley. A beneficial cumulative impact will be the change in land use at four, county operated landfills on public lands. These are located in the foothills of the Gila Mountains, and are identified as follows: the Central, San Jose, Eden, and Ft. Thomas landfills. Over 70 acres will be returned to multiple use in the long term after the landfills close.

4.8 Cultural Resources

4.8.1 Proposed Action

The study area for cultural resources is the project area. Cumulative impacts to cultural resources are considered for the Gila Valley.

Impacts to the 38 identified sites could range from total destruction by mining and facilities construction to partial destruction resulting from vehicular traffic, associated mining activities, and vandalism resulting from increased human presence. A treatment program has been developed, which considers all 38 sites identified. The treatment program has been reviewed and accepted by BLM and the State Historic Preservation Officer (SHPO) and will be initiated before any surface disturbance is allowed.

4.8.2 Alternatives

No Action

None of the cultural sites surveyed would be disturbed.

Alternative Access Route

The alternative access route has been surveyed for cultural resources. The one historic site found during the survey is close to the mine access road. Road use would not affect any cultural sites.

Alternative Heap Leach Pad Configurations

The alternative pad sites were surveyed, and if an alternative configuration is selected, several

additional cultural sites will be impacted. Since the mitigation program will consider all 38 sites, alteration of the pad location should not have additional impacts.

Alternative Groundwater Disposal Techniques

The method of groundwater disposal would not impact the cultural sites.

Alternative Reclamation Techniques

This alternative will not cause additional impacts to cultural resources, because the treatment program will satisfy the historic preservation requirements for all sites.

Partial Backfilling of the Pit

Partial backfilling of the pit would have no effect on cultural resources.

4.8.3 Cumulative Impacts

Cultural site density within this portion of the Gila Valley is estimated as high, with no total figure available. The 38 sites identified on the mine lease area comprise a small percentage of the total expected site population. Review of the data and consultations with SHPO and recognized cultural resource experts indicate that when the mitigation program is implemented, the project will not cause adverse cumulative impacts to cultural resources.

4.8.4 Mitigation

The cultural resource consultant, SWCA, has submitted a treatment plan to the BLM and SHPO for approval. The treatment program provides for mitigation of impacts to all sites. The treatment program also considers human remains if they are encountered.

4.8.5 Summary of Impacts

Cultural sites in areas of surface disturbance will be committed to either destruction or data recovery; in either case, additional information will not be available to future researchers. Sites not directly impacted will be protected in other ways (blocking of access and placing areas off-limits). Impacts from increased human presence remains a possibility, but can be addressed by signing and work force education. Site conditions will be monitored by periodically inspecting the sites during the life of the project.

4.9 Aesthetics

4.9.1 Proposed Action

Visual Impact

The visual resource investigation for the Proposed Action was conducted using procedures established in the BLM Manual, Section 8400, Visual Resource Management (VRM). Under the VRM system, the affected environment for visual resources is characterized using an inventory and evaluation process which addresses scenic quality, viewer sensitivity, and distance between viewers and a proposed modification to the landscape. The results of the three-step inventory process are used to determine visual resource management classes for lands in the project area. Each VRM class has specific objectives defining how the visual environment is to be managed on lands so designated.

The existing BLM Safford District Management Framework Plan designates the project area as located within a VRM Class IV Area. This class allows for activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. The area is also classified as Scenic Quality C, Low Sensitivity, Background.

Under the BLM Safford District Resource Management Plan, the project would retain the VRM Class IV designation. A portion of Bonita Creek would be classified as Scenic Quality B, Medium Sensitivity, Middleground and Foreground. With the exception of a short stretch from Sanchez across Earven Flat, the project is not visible from the road east of Sanchez.

Because of the topography, the project site is not visible along most of Sanchez Road, and no project facility will be visible from normally accessible observation points within the Gila Box Riparian National Conservation Area. The waste rock dump may, however, be visible from a few high points along the southern National Conservation Area boundary, the nearest of these being about three miles from the dump. Project facilities are not visible from the old Safford-Morenci Trail.

The waste rock dump will be the most prominent facility from observation points to the east and southeast of the project area. The waste rock dump will be screened from view by topography from most observation points to the west, including Safford and Thatcher. The waste rock dump is to be constructed at the natural angle of repose of the rock, about 37 degrees, and will appear similar to

natural talus slopes but more regular in form. It is to be built lower than the mountains and ridges immediately north and west, so that it will not stand out against the sky.

Waste rock dumping activity would be visible at times from portions of U.S. Highways 666 and 70 east of Solomon, and from some nearby communities.

When completed, the ore heap will be the most prominent and usually only facility visible when viewed from the west and south, including the Safford-Thatcher area. The heap will be constructed at approximately the natural angle of repose of the crushed ore. They are to be built close to the base of the Gila Mountains and will appear lower than the topographic crest when viewed from almost any off-site location. The flat-topped heap would be mesa-like in appearance, similar to other landforms in the nearby terrace, and elsewhere in the vicinity.

Ore is to be placed on the heaps by conveyor/stacker, rather than by dump trucks, which will result in a low level of activity on the heap. Ore placement will be visible from many observation points, but will not be prominent due to the distance and low level of activity. Leaching of the ore involves spray or drip irrigation of the heap, which should not be visible from off site.

The ponds are to be constructed below ground level, and will only be visible from higher elevations of surrounding mountains. They are also to be relatively small, and will not appear prominent from any off-site location.

Night lighting for the project must meet the Graham County Lighting Ordinance, and will have a low, long-term impact.

Acoustic Impact

Major sources of noise from the project would include:

- mobile mine equipment
- blasting
- crushers and screens
- conveyors, and
- rock dumping.

Typical sound levels from operation of mine and plant equipment are given in Table 4-4. MSHA regulations require that employees not be exposed to more than 90 dBA (decibels, A scale) for an eight-hour shift. Engineered control measures will be used by the mining company to ensure that

equipment noise does not exceed this level at the operator's position or other locations where workers might be exposed. This limits the equipment noise near the source, which in turn limits the noise at distant receptor points.

Sound dissipates as the square of the distance in free air. Reflection from structures, topography and atmospheric layers can increase or decrease the sound level, depending on whether sound waves are directed toward or away from the receptor point. Vegetation and other sound absorbing materials will tend to reduce both direct and reflected sound waves. Wind direction and velocity can also affect the sound intensity at a receptor point.

Table 4-4
TYPICAL SOUND LEVELS FOR MINE AND PLANT EQUIPMENT

EQUIPMENT/OPERATION	DISTANCE (feet)	SOUND LEVEL
Haul truck, loaded	30	80 dBA
Haul truck, unloaded	30	77
Water truck, 10-12 mph	30	75
Crawler tractor	100	72
Wheel loaders (2 working together)	55	71
Screens	*	95-105
Blowers, crushers, feeders, chutes	*	90-105
Motors, gear drives, hoppers, pumps	*	85- 95
Belt conveyors	*	75- 85
Primary blasting	1,000	70-120

* At operator's position, assume 30 feet

SOURCE: M&EC and manufacturers data.

The approximate distances from project facilities to the nearest residences are as follows:

Pit	3,000 feet
Crushing Plant	3,200
Waste dumping point (closest)	1,200
Ore stacker discharge point	6,000
Overland conveyor	3,200

Haul truck and heavy equipment noises from the pit will be reduced to one ten-thousandth (1×10^{-4}) of their original level in free air by the time they reach the nearest residence. Intervening topography and

vegetation may further reduce the noise level. Once the pit is developed below grade, beginning in year 2 of operation, very little in-pit noise will reach the property boundary.

Sound waves from blasting below the pit rim would be directed primarily upward by the walls of the pit. The only sound waves to reach off-site receptor points would be those reflected from topography, clouds or inversion layers in the atmosphere. Blasting above the pit rim would occur primarily during mine development, but also at various other times during the life of the mine, mainly on the ridges on the north and east sides of the pit. Most of the pit area is covered by a blanket of alluvium up to 300 feet thick, which may require little blasting.

The closest residences to above-pit-rim blasting locations are approximately 3,200 feet distant. These residences, however, are shielded by topography from direct sound waves. The closest partially-shielded residences are approximately 4,400 feet away. Sound waves would be attenuated to about one-twentieth (0.05) of their intensity at 1,000 feet from the blast at the nearest residence, without allowing for further reduction by reflection and absorption. Also, blasting would occur during normal business hours, mostly in the afternoons, when typical agricultural and residential noise and movement would make project noise less noticeable.

4.9.2 Alternatives

No Action

Under the No Action alternative, there would be no additional noise or visual impacts.

Alternative Access Route

The alternative access route options would increase traffic noise along the Sanchez Road. Upgrading of existing dirt roads and substantial increases in traffic on the Sanchez route would produce low, long-term visual and noise impacts.

Alternative Heap Leach Pad Configurations

The alternative heap leach pad configurations will have the same impacts on visual resources and noise levels as the proposed action.

Alternative Groundwater Disposal Techniques

The groundwater disposal program selected will have low impacts on visual resources and noise levels.

Alternative Reclamation Techniques

Revegetation of sideslopes of leach pads would be a visual improvement over the proposed action. Long-term noise levels would be unaffected.

Partial Backfilling of the Pit

Partial backfilling of the pit would result in lengthened operations, with corresponding noise, for approximately one or two years.

4.9.3 Cumulative Impacts

Cumulative impacts to aesthetics are evaluated using the Gila Valley as a frame of reference. Historic mining operations have had little acoustic impacts in the valley. Visual impacts from historic and current activities are noticeable from many points in the Safford-Thatcher area. The results of these activities are clearly visible at the Dos Pobres, San Juan and Lone Star mines. Activities at the Sanchez and Dorothy B. mines are only noticeable from locations near the mines. The development of the Sanchez and Lone Star mines will have localized acoustic impacts and widespread visual impacts. Portions of the Sanchez mine's heap leach pad will be clearly visible in the Safford-Thatcher area. The Lone Star mine will have major impacts on the skyline of the Gila Mountains and will be visually prominent from many areas in the Gila Valley. The cumulative impact from these projects is clearly significant. The Sanchez mine will create a small fraction of the total aesthetic impacts.

4.9.4 Mitigation

Blasting will occur during normal business hours to decrease noticeability. The waste rock pile will be sloped to resemble natural contours. Tops of the waste rock pile and the leach pads will be revegetated. Buildings and facilities will be painted earth tone colors.

4.9.5 Summary of Impacts

The proposed action will produce low, long-term impacts to visual resources and noise levels. Analysis of the data indicates that there will be no cumulative or significant adverse impacts to visual resources and noise levels.

4.10 Socioeconomics

4.10.1 Proposed Action

The study areas for socioeconomics include Graham and Greenlee Counties, and the State of Arizona. Data and statistics presented in this section are from Leaming, 1991.

Employment and Personal Income

The Sanchez Copper Project mining plan calls for a total of 210 employees when operating at full production levels. This represents a direct addition of 210 jobs to the Graham County economy. Most of these jobs could be filled by local residents, but approximately 25 would have to be filled by managerial and technical employees brought in from outside the immediate area.

Wages and salaries paid to project employees are estimated at $8,155,700 per year average over the 17 years of full production expected for the project. A contribution of this amount of personal income to the local economy each year would make the Sanchez Copper Project directly responsible for 6.5% of the basic personal income received by residents of Graham County and 3.5% of all personal income received by the county's residents. This addition to the county's personal income would reduce the economic reliance of the county on retirement and welfare from 42.2% to 39.5% and its reliance on basic government employment from 27.7% to 25.9%.

The direct addition of 210 jobs to the employment level in Graham County would increase total employment in the county by 2.8% over the 1990 average to 7,760. At the same time, the probable importation of 25 new employees from outside the area would increase the local labor force by 0.3%. The net result would be a drop in the average unemployment rate from 7.4% in 1990 to a rate of 5.1%.

Local Purchases of Products and Services

It is expected that the project will incur costs for equipment, spare parts, operating supplies (including chemical reagents and explosives), electrical energy, motor fuel, and other products and services that will average $22,587,900 per year during the 17 years of full production. Of this total, it is expected that $6,661,200 worth of these products and services will be bought from suppliers in Graham County, with a total of $18,189,000 worth bought from suppliers throughout Arizona. Because of the nature of the structure of the Arizona economy, and as demonstrated by the purchasing patterns of other Arizona copper producers, it is expected that $5,985,900 worth of products and services will be bought each year from suppliers located in Maricopa County (the Phoenix metropolitan area), another $3,000,800 worth will be bought from suppliers in the Tucson metropolitan area (Pima County), and $2,533,200 worth will be bought each year from suppliers elsewhere in the state.

State and Local Taxes Paid Directly

Based on its expected rate of production, 1990 copper prices, and existing Arizona tax rates, it is expected that the Sanchez Copper Project will pay an average of $720,000 per year in severance taxes to the State of Arizona. Part of this annual severance tax payment will be retained by the State, but part will be distributed to county, municipal, and school district governments throughout the state, including those in Graham County.

It is estimated that the Sanchez Copper Project will pay annual property taxes of $1,266,400 to Graham County as collector for the State of Arizona, the county itself, the Solomonville School District, the Eastern Arizona Community College District, Mt. Graham Hospital, and other local taxing jurisdictions. In addition, the company annually will pay corporate income taxes, sales taxes, unemployment compensation and workers' compensation taxes, and miscellaneous other taxes and fees, primarily to the State of Arizona.

The separate, direct tax contributions to state and local governments are presented in Table 4-5. Distributions of these taxes are presented in Table 4-6.

Direct Effect on Population and Housing

Operation of the Sanchez Copper Project will most probably require the importation of 25 employees from outside of Graham County. These are likely to be heads of households, and therefore, their addition to the local population will result in the addition of approximately 87 more people to the county's population (an increase of 0.3% over the 1990 Census). This would result in a demand for 25 new housing units, representing about 10% of all new housing which Graham County has added each year for the past decade and 38% of the new single family homes built in the county each year. It also represents about 4% of the vacant homes in the county. The project would thus tend to soak up some of the vacant homes in the current real estate market in Graham County and would tend to stimulate, rather than burden, the county's residential construction industry.

Direct Effect on Local Schools

The most probable increase of 25 new households in Graham County caused by the opening of the Sanchez Copper Project would add about 37 new school-age children to the existing population. This amounts to 19% of those attending the Solomonville Schools, but only 0.8% of the 4,683 students attending all four of the school districts in the eastern Gila Valley that would be directly affected by the increase. This would not result in any significant direct increase in school population in any of the school districts closest to the project.

Table 4-5
DIRECT CONTRIBUTIONS TO STATE AND LOCAL GOVERNMENT REVENUES
(in 1990 dollars at 1990 tax rates)

Type of Contribution		Annual Amount
Severance Tax		$ 720,000
Property Taxes		
State of Arizona	$108,100	
Graham County	448,000	
Solomonville Schools	226,000	
Eastern Arizona College	257,200	
Mt. Graham Hospital	111,200	
Other Jurisdictions	115,900	1,266,400
Corporate Income Tax		86,600
Sales Tax on Purchases		624,100
State Payroll Taxes		143,200
Miscellaneous Taxes and Fees		20,300
TOTAL		$2,860,600

SOURCE: WEAC, 1991, based on data from the Arizona Department of Revenue, the Arizona Tax Research Foundation, and existing Arizona copper producers.

Table 4-6
STATE AND LOCAL GOVERNMENTS RECEIVING REVENUES FROM THE PROJECT
(based on 1990 conditions)

Government Unit		Annual Revenue
State of Arizona		$ 604,000
Graham County		
County Government	$448,900	
Municipalities	1,000	
School Districts	231,700	
Other Jurisdictions	484,300	1,165,900
Maricopa County Local Governments		658,000
All Other Local Governments in Arizona		432,700
TOTAL		$2,860,600

SOURCE: WEAC, 1991

Direct Effect on Other Local Government Services

The most probable addition of 25 new households to the Graham County population would not place any undue burden on existing public safety services in the county. The addition of a new industrial activity with its potential for industrial accidents, however, could cause some potential strain on emergency services in the county. To mitigate this potential adverse impact, the company would train a sufficient number of its employees as Emergency Medical Technicians to have at least two such trained personnel on each work shift to augment existing community personnel.

Direct Effects on Local Transportation Facilities

The project is expected to operate on the basis of three shifts per day, and there will be a significant increase in traffic on local roadways in the area of the operation by commuting workers during shift changes. Local roads may require improvements to accommodate increased truck traffic.

The presence of the Sanchez Copper Project in eastern Graham County could provide some stimulus to activity at the Safford Municipal Airport, thereby using what is a substantial excess capacity and lowering unit operating costs for the city.

Direct Effects on Other Local Service Sectors

The opening and operation of the Sanchez Copper Project and its resulting probable small increase in area population is not likely to have any significant impact on local health care facilities.

The project will be a major user of electric power. This will probably require some expansion of transmission facilities in and near the project, but these will be paid for by the project in negotiating power rates with the Graham County Electric Cooperative. Excess generating capacity already exists in Arizona and the Southwest; therefore, the project should not place an undue burden on existing electrical generating capacity in the area.

Indirect and Accumulated Effects on Income

The full economic impact of the Sanchez Copper Project will not be limited to the direct contributions of the enterprise to personal, business, and government income through the project's own payrolls, purchases, and tax payments. The money received by the project's employees as wages and salaries, by local and state businesses as sales receipts, and by local and state governments as taxes and fees, will circulate and recirculate a number of times within the county and statewide economies before being dissipated through leakages or outflows from these economies to other states and the national economy. As this money circulates and recirculates, it creates additional indirect personal, business, and government income in a ripple or multiplier effect. As a result of this ripple effect, the gains from

any new enterprise are multiplied well beyond the direct impacts of payroll, purchases, and taxes paid directly by the enterprise itself.

In the case of the Sanchez Copper Project, its operation at full-scale production will create indirect economic gains in personal income, business income, and local government revenues for Graham County. The full economic gains to be realized (on an annual basis) by Graham County from the operation of the project are presented in Table 4-7. For the economy of the entire state, the direct, indirect and accumulated contributions to personal income, business income and government revenues for each year of operation are presented in Table 4-8.

Table 4-7
ACCUMULATED ECONOMIC EFFECT OF THE PROJECT ON THE ECONOMY OF GRAHAM COUNTY, ARIZONA

		Annual Contribution During Average Year of Full Production
The operation of the Sanchez Project mine and plant will create for the Graham County economy a:		
TOTAL DIRECT CONTRIBUTION OF		**$15,982,800**
Including direct gains in:		
Personal Income	$8,155,700	
Business Income	6,661,200	
Local Government Revenues	1,165,900	
which, because of the circulation and recirculation of income through the county's economy will result in a:		
TOTAL INDIRECT CONTRIBUTION OF		**$22,254,400**
Including indirect gains in:		
Personal Income	$4,481,900	
Business Income	16,415,800	
Local Government Revenues	1,356,700	
to create an:		
ACCUMULATED ECONOMIC GAIN OF		**$38,237,200**
Including combined direct and indirect gains in:		
Personal Income	$12,637,600	
Business Income	23,077,000	
Local Government Revenues	2,522,600	

NOTE: Amounts are in 1990 dollars
SOURCE: WEAC, 1991

Table 4-8
ACCUMULATED ECONOMIC EFFECT OF THE PROJECT ON THE ARIZONA ECONOMY

		Annual Contribution During Average Year of Full Production
The operation of the Sanchez Project will create for the Arizona economy a:		
TOTAL DIRECT CONTRIBUTION OF		**$29,205,300**
Including direct gains in:		
Personal Income	$ 8,155,700	
Business Income	18,189,000	
State and Local Government Revenues	2,860,600	
which, because of the circulation and recirculation of income through the state's economy will result in a:		
TOTAL INDIRECT CONTRIBUTION OF		**$60,593,800**
Including indirect gains in:		
Personal Income	$11,713,300	
Business Income	44,913,600	
State and Local Government Revenues	3,966,900	
to create an:		
ACCUMULATED ECONOMIC GAIN OF		**$89,799,100**
Including combined direct and indirect gains in:		
Personal Income	$19,869,000	
Business Income	63,102,600	
State and Local Government Revenues	6,827,500	

NOTE: Amounts are in 1990 dollars
SOURCE: WEAC, 1991

Other Indirect and Accumulated Effects

The creation of added personal income indirectly in Graham County from the operation of the project will add approximately 281 new jobs to the county's employment figures. Combined with the 210 new jobs created directly by the project, that represents a new addition of 491 jobs to the county's employment statistics. Statewide, the project is expected indirectly to add 566 jobs to the state's employment figures. Combined with the 210 new jobs created directly by the project, that represents a net addition of 776 jobs to the state's employment total.

With the accumulated direct and indirect increases in employment expected from the impact of the Sanchez Copper Project, a corresponding increase in the population of Graham County is estimated at 550 persons, or about 160 households. The corresponding increase in housing demand is equivalent to 67% of the average number of new housing units put in place in Graham County over the period from 1981 to 1989. This magnitude of increase in demand for housing would allow the local construction industry to sustain its recent level of activity, but would not exceed its capacity.

The growth of about 2% in the total population of Graham County and the expected comparable increase in the number of school age children requiring education would not put undue stress on existing educational facilities, particularly in light of the increased government revenues available at the same time.

The same is true for public safety and other local government services. The increased demand for such services resulting from the expected population increase is well within the pattern of recent growth and would not place undue stress on existing government facilities or services.

A 2% increase in population, combined with the expected direct and indirect increases in personal income, business income, and local government revenues in Graham County as a result of the opening of the Sanchez Copper Project, is most likely to stimulate activity in the non-governmental service sectors of the Graham County economy while providing, almost immediately, the means to finance the resultant growth.

A major, but not quantifiable, economic benefit created by the development and operation of the project will be the added strength provided to the Graham County economy by the entry of another strong basic (income importing) economic enterprise. This will tend to diversify the local economic base and reduce undue dependency on any one existing sector or single employer. The creation of a new industry in Graham County and the consequent increase in employment and decrease in unemployment is likely to have a positive impact on local property values, particularly the values of commercial property in the Safford-Thatcher-Pima community. The full extent of that impact will depend in large part upon the reactions of the local business community to the new opportunities created by the presence of a new economic entity providing both employment and sales opportunities.

In addition to the favorable economic impact on Graham County and the state of Arizona, copper production by the Sanchez Copper Project will reduce U.S. dependency on imported copper and improve the national balance-of-trade. In 1989, the "net import reliance as a percent of apparent consumption" was 9%, or 203,000 tons of refined copper with a value of approximately $526 million,

as reported in the U.S. Bureau of Mines Material Commodity Summaries - 1990. Production from the Sanchez Project will reduce net imports by 25,000 tons per year, with a value of $65 million at 1989 prices.

The proposed action will have a significant, beneficial, long-term impact on the overall health of Graham County. The action will provide new jobs and reduce unemployment. An additional $8.15 million of annual personal income will be generated in the county, which will also provide significant indirect contributions to the accumulated economic gain.

4.10.2 Alternatives

No Action

The No Action alternative would preclude the positive socioeconomic impacts on the Safford area.

Other Alternatives

The alternative access route, siting options, groundwater disposal techniques and reclamation techniques would not alter the socioeconomic impacts caused by the proposed action.

4.10.3 Cumulative Impacts

The following sub-sections combine the existing socioeconomic environment of Graham and Greenlee Counties. This information was developed by Western Economic Analysis Center (WEAC) in January 1992.

Population

In 1990, the United States Bureau of the Census determined the population of Graham and Greenlee counties, Arizona, to be a combined total of 34,562 persons, of whom more than three quarters, some 26,554 were residents of Graham County, with the other 23%, some 8,008, residents of Greenlee County. Virtually all of the residents of Greenlee County lived in the incorporated municipalities of Clifton and Duncan and in the nearby unincorporated communities of Morenci and Starge, all in the southern part of the county and all within the Safford trade area.

The population of the two counties has been relatively stable since 1980, with declines in the population of Greenlee County offset by increases in the population of Graham County. In the decade prior to 1980, the populations of both counties had increased significantly. Table 4-9 lists combined population figures for the years 1970 through 1990.

Table 4-9
POPULATION OF GRAHAM AND GREENLEE COUNTIES, ARIZONA
1970-1990

Year	Population	Year	Population
1970	26,908	1981	34,300
1971	28,700	1982	34,400
1972	28,800	1983	33,300
1973	30,300	1984	33,500
1974	32,400	1985	33,000
1975	31,900	1986	32,500
1976	32,800	1987	32,700
1977	32,900	1988	32,400
1978	32,800	1989	33,100
1979	33,500	1990	34,562
1980	34,268		

Source of Data: WEAC, 1992, using information obtained from the United States Bureau of the Census and the Arizona Department of Economic Security.

Employment and Unemployment

In 1990, the civilian labor force in Graham and Greenlee Counties, Arizona, averaged 11,550, while the number of employed persons averaged 10,725, for an average unemployment rate in the two-county region of 7.1%. This was the lowest unemployment rate experienced in the region in the past decade. The total number of employed persons in the two counties in 1990 was the highest since 1981. As shown in Table 4-10, however, part of the decline in the unemployment rate since the high of 27.2% reached in 1982 was the result of a declining labor force, as unemployed persons left the region during the recession of the early 1980's to find work elsewhere or simply withdrew from the labor force. In 1990, the total labor force in the two counties was still 16% below the high reached in 1982, before such emigration or withdrawal took place.

The residents of Graham and Greenlee counties are heavily dependent upon a limited number of activities for jobs. As shown in Table 4-11, these include the retail and wholesale trade sectors and state and local governments as well as the mining industry. Virtually all of the jobs in the mining sector are provided by one large employer. In addition, seasonal agricultural work employs a large number of Graham County's residents and some residents of the Duncan Valley in Greenlee County.

Table 4-10
LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT IN GRAHAM AND GREENLEE COUNTIES, ARIZONA
1980-1990

Year	Labor Force	Employment	Unemployment Rate
1980	12,850	11,825	8.0%
1981	12,700	11,700	7.9
1982	13,775	10,025	27.2
1983	12,425	10,200	17.9
1984	11,475	10,600	7.6
1985	10,675	9,325	12.6
1986	10,575	9,375	11.3
1987	10,850	9,800	9.7
1988	10,725	9,600	10.5
1989	11,300	10,425	7.7
1990	11,550	10,725	7.1

Source of Data: WEAC, 1992, using information obtained from the Arizona Department of Economic Security

Table 4-11
COVERED WAGE AND SALARY EMPLOYMENT IN GRAHAM AND GREENLEE COUNTIES, ARIZONA
(First Quarter 1990 - by place of work)

Industry	Number of Employees	Percent
Agriculture (1)	240	2.9
Mining	1,600	19.1
Manufacturing	200	2.4
Construction	280	3.3
Transportation & Public Utilities	170	2.0
Wholesale and Retail Trade	1,825	21.8
Finance, Insurance & Real Estate	125	1.5
Services	965	11.5
Federal Government (2)	315	3.8
State and Local Government	2,660	31.7
TOTAL	8,380	100.0

NOTE: Includes only employees covered by the employment security laws of Arizona. Does not include self-employed persons, who are mostly in trade, services, and agriculture.

(1) Excludes more than 1,000 seasonal farm workers not covered by the employment security laws of Arizona.
(2) Excludes some federal government workers who are not covered by the employment security laws of Arizona.

Source of Data: WEAC, 1992, using information obtained from the Arizona Department of Economic Security

Personal Income

Total personal income received by residents of Graham and Greenlee counties has risen substantially since the early 1980's. As shown in Table 4-12, the total amount of personal income received by those living in the two-county region has risen by almost half since the recession low of 1982 to exceed $344 million in 1989, the latest year for which reliable estimates are available.

Table 4-12
PERSONAL INCOME RECEIVED BY RESIDENTS OF GRAHAM AND GREENLEE COUNTIES, ARIZONA
1981-1989

Year	Wages and Salaries(1)	Total Personal Income(2)
1981	$154,292,000	$261,768,000
1982	119,686,000	232,100,000
1983	135,791,000	247,174,000
1984	144,081,000	268,982,000
1985	140,382,000	257,414,000
1986	143,660,000	270,656,000
1987	150,230,000	291,246,000
1988	161,985,000	321,206,000
1989	169,767,000	344,205,000

(1) Earned by place of work.
(2) Received by place of residence.

Source of Data: WEAC, 1992, using information obtained from the Bureau of Economic Analysis, U.S. Dept. of Commerce

As shown in Table 4-13, the total of $344,205,000 in personal income received by residents of Graham and Greenlee counties in 1989 came largely from a small number of sources. The largest was government, including federal, state, and local government employment as well as transfer payments (mostly social security and other federal retirement benefits and welfare payments). Dividends, interest, and rents were also a large source of personal income in Graham and Greenlee counties in 1989, but much of this personal income involved payments made by residents of the two-county region to other residents of the region, as the basic income brought into the region from outside circulated within the local economy. The largest source of such basic income, after state and federal government, was mining. (See Table 4-14.)

Table 4-13
PERSONAL INCOME OF GRAHAM AND GREENLEE COUNTY RESIDENTS - 1989

Source of Income	Amount of Personal Income
Earnings by industry (by place of work)	
Agriculture and related	$ 23,826,000
Mining	63,515,000
Construction	10,216,000
Manufacturing	5,327,000
Transportation & Public Utilities	8,861,000
Wholesale and Retail Trade	23,495,000
Finance, Insurance, & Real Estate	4,050,000
Services	23,995,000
Federal Government	10,638,000
State and Local Government	57,379,000
Dividends, Interest, and Rent	43,041,000
Net Transfer Payments (1)	70,318,000
Earnings by non-residents	-456,000
TOTAL	$344,205,000

(1) Total transfer payments minus personal contributions for social insurance.

Source of Data: WEAC, 1992, based on data obtained from the Bureau of Economic Analysis, U.S. Dept. of Commerce

Table 4-14
BASIC PERSONAL INCOME RECEIVED BY RESIDENTS OF GRAHAM AND GREENLEE COUNTIES, ARIZONA - 1989

Source of Income	Amount of Income	Percent
Agriculture and related	23,826,000	11.7
Mining	63,515,000	31.1
Manufacturing for export	1,996,000	1.0
Tourism	787,000	.4
Federal Government Employment	10,638,000	5.2
State Government Employment	33,117,000	16.2
Retirement and Welfare	70,318,000	34.4
TOTAL	$ 204,197,000	100.0

Source of Data: WEAC, 1992, based on data obtained from the U.S. Department of Commerce.

The cumulative impacts to population, employment, and annual payroll have been analyzed. The present, proposed, and foreseeable future projects analyzed in association with the proposed action are the San Jose Prison Expansion, the Mt. Graham Astrophysical Area, and the Phelps Dodge Lone Star project.

Population

The population for the two counties in 1990 was 34,562. The labor force was 11,550 in 1990, down from a high of 13,775 in 1982. The 1990 employment was 10,725, with an unemployment rate of 7.1%. At least 800 people who are unemployed may be available for the labor force. In addition, part-time employees and seasonal workers are not included in this estimate. The total population available to work in Graham and Greenlee counties may be substantially higher.

Employment

The following employment estimates were obtained from existing data for each of the projects listed below:

AZCO's Sanchez Copper Project	210
Phelps Dodge Lone Star (potential)	500 - 700
San Jose Prison Expansion	118
Mt. Graham Astrophysical Area	30
	858 - 1,058

AZCO has estimated that approximately 10% of the employees (21 persons) may come from outside the two-county area. Assuming the same ratio for the Phelps Dodge project, 50 - 70 employees would relocate to the area. The prison employment ratio (non-residents/residents) is unknown, but a similar 10% estimate would yield 12 employees from outside the area. The Mt. Graham project will likely "import" 20 highly trained employees from outside the area. Combining these estimates, 103 - 123 persons would be hired from outside the local labor force, and 755 - 935 would be hired locally.

Annual Payroll

The following personal income data has been published for three of the proposed projects:

Company	Annual Payroll
AZCO Sanchez	$ 8.15 million
Mt. Graham	.75 million
San Jose Prison	2.50 million

An estimate for the Phelps Dodge Lone Star project, extrapolated from AZCO's wage data, would amount to $19.4 to 27.1 million annual payroll.

If more than one of the proposed projects are developed, cumulative socioeconomic impacts will be beneficial. Safford and Graham/Greenlee counties have an available labor force and infrastructure to accommodate the proposed projects. There is sufficient time (5+ years) to develop additional infrastructure to absorb the potential Phelps Dodge Lone Star project in the foreseeable future.

4.10.4 Mitigation

No mitigation is proposed for socioeconomics.

4.10.5 Summary of Impacts

The proposed and foreseeable projects will have long-term, cumulative and significant beneficial impacts.

4.11 Transportation

4.11.1 Proposed Action

The study area for transportation is the Gila Valley.

The proposed action is to use the existing highway system to transport the majority of the goods, supplies and equipment to Safford. Some material may come in by railroad to Safford. Access from Safford to the project site is along two routes -- the 8th Avenue (Safford) Bridge to Airport Road, and the Solomon Bridge to Sanchez Road. Processing supplies will be routed up Solomon Pass Road to the processing facilities, and mine supplies will be routed down Sanchez Road to the pit area facilities.

Supplies and materials for the project will be transported by trucks on U.S. Highway 70. Approximately 28 trucks will enter the facilities each day. Traffic counts on U.S. Highway 70 between 8th Avenue and U.S. Highway 666 total 12,000 vehicles per day. Traffic counts on U.S. Highway 70 between U.S. Highway 666 and the Sanchez Road intersection total 5,300 vehicles per day. The 28 trucks plus 89 other vehicles would increase the traffic count by 234 (assuming each vehicle crosses the counter twice -- while coming to and leaving the area). This would result in a traffic increase of 2% to 4% on these two sections of road.

The preferred access routes will send most of the heavy truck traffic up the Solomon Pass Road to the processing facilities. The majority of the increased traffic along Sanchez Road will be passenger cars and pick-up trucks.

Selected, local, average daily traffic (ADT) counts reflecting existing use are as follows:

Location	ADT Count
8th Avenue (Safford) Bridge	2,500
Airport Road	1,300
Solomon Bridge	270
Sanchez Road/Airport Road Intersection	190
Proposed Mine Entrance (Sanchez Road)	110

Table 2-2, Projected Traffic, indicates the increased vehicle use per day along Solomon Pass Road and Sanchez Road once mine operations commence. On Solomon Pass Road, there would be 41 additional vehicles per day (times 2 for round trips = 82 ADT increase); on Sanchez Road, there would be 78 additional vehicles per day (times 2 for round trips = 156 ADT increase). Sanchez Road is designed as rural collector for an ADT count of 400 at 40 mph. Solomon Pass Road will be upgraded to this standard as mine operations commence.

4.11.2 Alternatives

No Action

Under the No Action alternative, the increased road traffic would not be experienced.

Access Routes

Table 2-5, Projected Traffic, incorporates an average of 2 workers per vehicle, resulting in 79 vehicles per day for employee commuting traffic. A maximum impact calculation would assume that each employee drives his/her own vehicle, thus adding another 79 vehicles (times 2 for round trips = 158) to the 236 increase in traffic previously calculated. Therefore, the maximum ADT count increase as a result of the proposed action, assuming each employee drives his/her own vehicle, would be 394 along the Sanchez Road. This would increase the ADT counts at the Sanchez Road/Airport Road intersection to 584, and at the mine entrance to 504. The Sanchez Road is considered a rural collector, and is designed for an ADT count of 400 at 40 mph.

The alternative action would have a significant, adverse impact on the human environment and quality of life along the Sanchez Road on the north side of the Gila River.

Partial Backfilling of the Pit

Partial backfilling of the pit would result in additional fuel and operational materials being transported to the site for an additional one to two years.

Other Alternatives

Transportation would not be affected by selection of different alternatives for heap leach pad configuration, groundwater disposal techniques, or reclamation techniques.

4.11.3 Cumulative Impacts

The proposed and foreseeable projects are dispersed in the Gila Valley. The common, major highways used by all projects would be U.S. Highway 70 and 666. These highways are designed for, and would accommodate, the additional regional traffic from the projects. The most significant impact would be an increased potential for accidents at the intersection of Highway 70 and 8th Avenue.

The proposed action, the Dorothy B. Placer Mine, and Phelps Dodge's potential Lone Star project are located on the north side of the Gila River. These projects can be accessed by 8th Avenue and the 8th Avenue (Safford) Bridge and/or the Sanchez Road and Solomon Bridge. AZCO has projected 118 vehicles per day for its operation, the Dorothy B. may have about 25 vehicles per day, and Phelps Dodge estimates 500 to 700 commuting employees. The 8th Avenue access is designed for, and has the capacity to handle, this increased traffic, with low to medium impacts. Sanchez Road is not designed for a significant increase in traffic, and impacts would be significant.

4.11.4 Mitigation

The proposed action's mitigation plan is to route all traffic (other than commuting employees) over the 8th Avenue (Safford) Bridge. Improved traffic signals and turn signals at the intersection of Highway 70 and 8th Avenue may be necessary for safety mitigation. Employees will be encouraged to carpool to reduce traffic. AZCO and the county have evaluated the Sanchez Road and Solomon Pass Road accesses and have developed a mitigation program for the proposed action access route. This mitigation program (presented in Section 2.1.1) was submitted to the BLM during the comment period for the Draft EIS.

4.11.5 Summary of Impacts

The proposed action will not impact transportation to the town of Safford. Transportation to the project site along the proposed access route will not have a significant, adverse impact on local traffic. Mitigation measures are planned for Sanchez Road and Solomon Pass Road.

4.12 Unavoidable Adverse Effects

Implementation of the proposed action would cause some adverse effects during the life of the project which cannot be avoided. The intensity of these unavoidable effects will be lessened by mitigation measures. In this discussion, short term is defined as the life of the project (17-20 years); long term is defined as beyond the proposed life of the project. Adverse effects which cannot be entirely mitigated include short-term and long-term alteration of landforms and surface drainage patterns. Short-term consumption of groundwater by the operation will not have a significant impact on current groundwater users.

Local air quality will be affected over the short term by particulates created by mining and processing operations. However, such impact would be minor, and resulting air quality would not violate Arizona or federal air quality standards.

Increased soil erosion from wind and water would occur over the short term at the project site. The proposed erosion control program will minimize this erosion to acceptable levels but, because of the magnitude of the site, cannot completely eliminate such erosion.

For the short term, impacts to vegetation cannot be mitigated. The length of time that these impacts remain unmitigated will depend on the specific component location, the length of the mining operation, and the time necessary to re-establish vegetation. This time period would extend from initial disturbance through the successful establishment of a self-sustaining vegetation community. Vegetation will be disturbed or removed from approximately 1,400 acres. Revegetation will be implemented on approximately 765 acres, and the resulting vegetation communities will be similar to original communities for the long term.

Wildlife communities will be affected in both the short and long term. Site development will displace wildlife onto adjacent habitats in the short term, particularly mule deer and javelina. Following closure and revegetation, wildlife would be expected to return to the site.

There will be a long-term alteration of viewshed in the Lower Gila Mountains caused by the introduction by the project of contrasting colors, lines, and landforms. Over time, these introduced elements will become less noticeable.

Increased traffic in and around Safford, including industrial trucks, will have an adverse, short-term impact on traffic safety and the human environment.

A short-term increase in the population of Graham County would result from the project construction and operation. Additional people may move to the area as a result of the corresponding opportunities for employment in the service sector. This effect can be considered both beneficial and adverse. The current shortage of rental housing units would be somewhat aggravated by the increased population.

4.13 Short-Term Use Versus Long-Term Productivity

This section discusses the balance between the short-term use of the site by the project and the long-term productivity provided by the site without the project. In this discussion, short term is defined as the life of the project (17-20 years); long term is defined as beyond the proposed life of the project.

The current uses of the site include mineral exploration, cattle grazing, and wildlife habitat. Proposed productivity from the site includes production of copper cathode, approximately 210 jobs with an annual payroll of approximately $8.15 million, and tax revenues to Graham County in the amount of $1.16 million annually. The site is also producing some important wildlife such as javelina and mule deer. The resultant actual harvest of this wildlife resource is unknown, but it is estimated to be minimal. The project area also supports about 8 cows per year. If the proposed project were not implemented, these uses and levels of productivity would continue.

If the Sanchez Copper Project is implemented, some of the short-term uses of the site would be changed or altered for the 17-20 year life of the project. Wildlife habitat would be reduced, as the site disturbances would cause a loss of forage.

AZCO will pump approximately 1,600 gpm from the Lower Gila Conglomerate or the Upper Gila aquifer. The Lower Gila Conglomerate aquifer presently has limited use. Deep groundwater intercepted in the pit (estimated at 200 - 500 gpm) will offset water pumped from the process wells.

Following closure and revegetation, land use and productivity of the site would be similar to the conditions that existed prior to project construction. The open pit and sideslopes of the heap leach and waste rock dump would be permanently removed from vegetation production, but the remainder of the site would be revegetated with a native seed mix approved by the BLM, a seed mix which may include species that are more productive than those presently on site. Therefore, there is the potential that vegetation productivity may equal or exceed pre-project levels.

4.14 Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources results when actions alter an area to the point where it cannot ever be restored to its undisturbed condition. Also, a commitment that completely consumes or removes a non-renewable resource is considered an irretrievable commitment of that resource. The following section discusses irreversible or irretrievable commitments of the proposed action and the No Action alternative.

The excavation of approximately 400 million tons of waste rock and ore from the Sanchez Pit would be an irreversible commitment of public land resources as a result of project implementation. The copper contained in the ore would be irreversibly committed, but would be retrieved and placed in long-term use in the world.

A peak annual consumption of 3 million gallons of diesel fuel and 45,000 gallons of gasoline and approximately 87,600 MW-hours of electricity constitutes an irretrievable commitment of these resources.

Soil losses from handling, stockpiling, and erosion from topsoil stockpiles would be irreversible. With more than 20 acres of coversoil stockpiles on the project site containing about .5 million cubic yards, some erosional losses would occur but would be minimized by seeding the stockpiles for stabilization, by minimizing handling operations, and by implementing AZCO's proposed erosion control procedures.

The Sanchez pit would not be reclaimed, but may partially fill with water; exposed benches and slopes will rely on natural revegetation. This represents an irreversible, long-term loss of vegetation production and wildlife habitat on approximately 310 acres. The waste rock disposal area will eliminate a major (50% of the home range of one herd) habitat utilized by javelina, constituting an irreversible impact on the javelina population.

The mine pit, waste rock disposal area, and heap leach pads which remain after closure would constitute an irreversible alteration of the landforms, lines, and, in the short term, color of the landscape. These alterations of the visible quality of the area would soften over the long term, but are considered irreversible.

Mitigation stipulations have been proposed as part of the project approval which will satisfy the historic preservation requirements for the irretrievable loss of cultural resources.

If the No Action alternative were to be implemented, resources would not be committed to this project. The resources which would be consumed by the proposed action (e.g., fuel, electricity, reagents) would not be consumed, and the copper contained in the Sanchez deposit would not be recovered. However, fuel, electricity and reagents would be required elsewhere to produce copper at another location to meet the demand for copper. Impacts to various resources (e.g., air, water, soils, vegetation, wildlife) would be locally eliminated in the No Action alternative.

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5.0 Consultation and Coordination

5.1 Public Participation and Scoping

5.1.1 Introduction

The Safford District BLM Office (Gila Resource Area) arranged for, participated in the preparation of, and is responsible for this Final Environmental Impact Statement (EIS). This Final EIS has been prepared in order to review and analyze the Plan of Operations submitted by AZCO for the Sanchez Copper Project in Graham County, Arizona. The BLM has solicited public comments on the scope of the issues, concerns, and alternatives to be addressed in the Final EIS.

5.1.2 Public Information Meeting

A notice for a public information meeting was published in the Eastern Arizona Courier and the Arizona Daily Star for several weeks before the meeting. The general information meeting was informal and was held on August 28, 1991, at the Safford District Office of the BLM. Fifty-eight people signed in at the door. This meeting was the first opportunity for the public to have the project presented by the BLM and AZCO since the Plan of Operations had been submitted on August 2, 1991. Short presentations were made, and then the public was invited to ask questions. BLM personnel stated that a formal public scoping meeting would be held later in the year.

5.1.3 Public Scoping Meeting

A draft Memorandum of Agreement (MOA) between the BLM and AZCO for preparing the EIS, a public participation plan, and a time schedule were developed in August, 1991. After the MOA had been finalized and the State Director of the BLM authorized the Public Participation Plan, the official EIS process commenced. A Notice of Intent (NOI) to prepare the EIS was published in the Federal Register on September 27, 1991. The NOI solicited public comments for the proposed project on issues, concerns, and alternatives to be addressed in the EIS. The NOI also stated that a Public Scoping Meeting would be held in Safford on October 21, 1991, at the Public Library in the Phelps Dodge Room. At the Public Scoping Meeting, 52 people registered at the door, and 11 people requested to give oral testimony. The BLM also solicited written comments on the scope of the EIS and requested that comments be submitted by November 1, 1991; a total of 37 comment letters were received.

5.1.4 Summary of Comments

All substantial public comments regarding the scope of the Draft EIS are grouped according to subject matter and are summarized below. Further refinement and screening to determine which issues, concerns and alternatives are appropriate for consideration in a Draft EIS were completed and presented in the Public Participation Plan.

Letters and/or comments received during the scoping period regarding the Sanchez Copper Project are listed below.

DATE	INDIVIDUAL AND/OR AFFILIATION
08-19-91	Sean McLaughlin - Arizona Department of Environmental Quality
08-27-91	Gus Arzberger - State Senator, District 8
08-29-91	Graham County Board of Supervisors
09-03-91	Jay D. Colvin - Colvin Farms
09-03-91	Melinda and Kenneth Lee
09-05-91	Jack Hyde - Graham County Chamber of Commerce
09-08-91	Lainie Levick - Sierra Club, Grand Canyon Chapter
09-11-91	Thoron Lane - Southwest Wildlands Educational Institute
09-12-91	Donald H. Woodman
09-18-91	Safford City Council, City of Safford
09-27-91	Irene Schmoller - Cotton Clouds
10-02-91	Ted Lizanec, Jr. - Environmental & Earth Science Consultants
10-05-91	Timothy J. Flood - Friends of Arizona Rivers
10-21-91	Charles and Gay Cochran
10-21-91	J. M. Owens
10-22-91	Jessie Lasinsky
10-23-91	James F. Moser - Graham County Engineer
10-24-91	Marge Howerton
10-24-91	Delores Jaksich
10-24-91	Richard C. Moore
10-24-91	Ira A. Rozell
10-24-91	Richard B. Shealer, Sr.
10-25-91	Sandra Daniel
10-25-91	Yvonne Hunt
10-25-91	Lynn Jacobs

10-27-91	Susan Brandes - Sierra Club, Grand Canyon Chapter
10-27-91	Don Steuter - Sierra Club, Palo Verde Group
10-28-91	Lainie Levick - Sierra Club, Grand Canyon Chapter
10-29-91	Odell Henderson
10-30-91	Tim Stowe
10-31-91	Sherri Rozell
No Date	Bonnie Blackburn
No Date	Olga Cruz

11-09-91	Dr. Howard G. Wilshire
11-14-91	David A. Mullon, Jr. - Mineral Policy Center
11-15-91	David A. Mullon, Jr. - Mineral Policy Center
02-02-92	David A. Mullon, Jr. - Mineral Policy Center

Following is a list of the subjects comprising the scoping comments received regarding the proposed project:

- air resources;
- groundwater use and potential contamination;
- surface water;
- vegetation;
- wildlife / threatened & endangered species;
- Gila Box Outstanding Natural Area;
- cultural resources;
- socioeconomics;
- traffic / noise;
- toxics / hazardous waste;
- reclamation;
- cumulative impacts;
- proposed alternatives; and
- miscellaneous issues.

5.2 Public Participation Plan

The BLM developed a public participation plan to indicate the means of public contact, identify potential individuals and organizations from which to solicit comments, and outline time frames for accomplishment in accordance with 40 CFR 1506.6. The plan is a formal commitment to involve the public in the development of the EIS at all important steps as determined by regulation or policy. It outlines the individual steps for public involvement in the EIS process to identify and deal with public concerns and needs. This process assists the BLM in:

- Informing the public of the proposal and long-term impacts resulting from the action,
- Ensuring that public needs and desires are understood by the BLM, and
- Broadening the information base for decision making.

Public notice and opportunity for participation are mandated at three specific points in the EIS process:

1. The scoping period started with the Notice of Intent and included a formal Public Scoping Meeting (held in Safford, Arizona on October 21, 1991) and briefings for concerned individuals and groups.

2. The Draft EIS was made available for a 60-day public review period from March 13, 1992 through May 11, 1992. At the request of federal agencies, the comment period was extended until May 18, 1992. During the review period, public meetings were held in Safford to obtain comments.

3. A 30-day public review period for the Final EIS will begin with the Notice of Filing printed by the Environmental Protection Agency in the Federal Register.

Additionally, Gila Resource Area personnel are periodically holding information meetings to keep the public informed on the progress of the EIS.

5.3 List of Preparers

The following people had primary responsibilities for development and review of this environmental document, including conducting technical analyses; writing, reviewing, and editing draft documents; and managing the administrative process for this document.

U.S. DEPARTMENT OF INTERIOR - BUREAU OF LAND MANAGEMENT
GILA RESOURCE AREA, SAFFORD DISTRICT - INTERDISCIPLINARY TEAM

The interdisciplinary team members for the Sanchez Copper Project Draft EIS are identified below:

Area Manager, Gila Resource Area	- Margaret Jensen B.A. Environmental Science, Hampshire College 12 years of BLM experience
Geologist, Division of Resources	- Larry Thrasher B.S. Geology, University of Maryland M.S. Geology, University of North Dakota 6 years of BLM experience
NEPA Compliance Officers	- Cindy Alvarez B.S., Environmental Resources, Arizona State Univ. 12 years of BLM experience
	- Mike McQueen B.S., Biology, University of Oregon M.S., Interdisciplinary Science, Western Oregon State College 4 years of BLM experience
Public Affairs Officer	- Diane Drobka B.S. Wildlife Ecology, University of Arizona A.A. Journalism, Eastern Arizona College 11 years of BLM experience
Wildlife Biologist	- Albert Bammann B.S. Wildlife Biology, Humboldt State University M.S. Wildlife Biology, Humboldt State University 17 years of BLM experience
Archaeologist	- Manton Botsford B.S., Fine Art, University of Wyoming 14 years of BLM experience
Hydrologists	- Delbert Molitor B.S. Hydrology, Utah State University 14 years of BLM experience
	- Hana West B.S., Geography, Northern Arizona University M.S., Watershed Management, University of Arizona 1 year of BLM experience
Outdoor Recreation Planner	- Deb Smith A.A.S. Forestry/Recreation, Paul Smiths College B.S. Recreation Management, University of Idaho 5 years of BLM experience

INDEPENDENT ENVIRONMENTAL CONTRACTORS

FLETCHER ASSOCIATES (Contractor for BLM)

- Gary Fletcher - B.S., Agricultural Engineering, University of Wyoming; 18 years of experience in the coordination and management of multi-disciplinary environmental studies for mining projects, including the preparation of permit applications and Environmental Assessments / Environmental Impact Statements.

TRC ENVIRONMENTAL CONSULTANTS (Contractors for Fletcher Associates)

- Cliff Cole - B.S., Mechanical Engineering, Cornell University
  M.E., Mechanical Engineering, Cornell University;
  20 years of experience in dispersion modeling, emissions inventories, and air quality permitting. He has prepared, reviewed, and critiqued numerous air quality permit applications and Environmental Assessments, and has worked as both author and reviewer of EAs and EISs for private industry and for the U.S. EPA.

- Jim Beck - B.S., Mining Engineering, Michigan Technological University; 14 years of experience in mining project development and operations, with emphasis on coordinating the engineering, hydrologic and geologic sections of major EAs and EISs.

- Karen Spray - B.S., Geology, New Mexico Institute of Mining and Technology
  M.S., Geology/Hydrogeology, University of Kansas;
  8 years of experience in geologic and hydrogeologic investigation and evaluation, regulatory analysis and permitting, mining hydrogeology, and remedial measures evaluation and implementation.

- Greg Groene - B.S., Hydrology, Colorado State University; 11 years of experience coordinating groundwater and surface water hydrologic teams with emphasis on hydrogeologic evaluations, groundwater monitoring program development, groundwater modeling, and water quality characterization related to proposed mining projects.

- Fred Mark - B.S., Geology, University of Idaho; 17 years of experience in all phases of exploration, evaluation, development and operation of mineral projects, including soil and rock sampling to determine acid-generation potential and trace element content.

- Eric Farstad - B.S., Meteorology, Metropolitan State College; 2 years of experience in air quality modeling and pollutant dispersion and transport with special experience in modeling particulate matter dispersion at mining operations.

WESTERN RESOURCE DEVELOPMENT (Contractors for Fletcher Associates)

- David Johnson - M.S., Environmental Toxicology, University of Utah
  M.S., Biology, University of Colorado;
  18 years of experience in ecological inventory and analysis of vegetation communities; the design and implementation of reclamation programs; wetlands investigations; threatened and endangered plant species studies; and the production of the ecology section of EAs and EISs. He has worked on 84 mine projects in 13 states and prepared the ecology sections for more than 30 EAs and EISs.

- Rick Thompson - B.S., Wildlife Research, University of Wyoming
  M.S., Zoology and Physiology, University of Wyoming;
  14 years of experience as the Principal Investigator/Task Leader conducting original wildlife research, baseline and monitoring studies, wildlife impact assessments, biological inventories, threatened and endangered species surveys, and expert testimony with additional experience in statistics, reclamation, and the siting of project facilities in 9 western states.

- Steve Peterson - M.S., Biology, University of Colorado;
  16 years of experience as a professional ecologist. He has a background of baseline vegetation inventory and analysis; landscape and reclamation design; and a comprehensive knowledge of the autoecology of threatened and endangered species of the Rocky Mountain West, including inventory.

- Cathy Frank - B.A., Biological Science, University of Colorado;
  6 years of experience as a professional biologist. Ms. Frank has ecological field and data analysis experience, and technical skills in both graphics design, CAD, computer modeling, and word processing.

OTHER CONTRIBUTING CONSULTANTS

- George F. Leaming, Ph.D. - B.S., Mining Engineering, Lafayette College
  M.B.A., University of Arizona
  Ph.D., (Economics), University of Arizona;
  Western Economic Analysis Center
  Socioeconomic Impacts

- R. Thomas Euler - B.A., Anthropology, University of Colorado;
  SWCA Environmental Consultants
  Cultural Resources

5.4 List of Agencies and Organizations to Whom Copies of this Statement Will Be Sent

The BLM is requesting comments on the Final Environmental Impact Statement from all interested individuals, federal and state agencies, and interest groups. Because of the size of the mailing list, only a partial list of those who will receive the document follows.

Federal Agencies

Department of Agriculture
- Forest Service
- Soil Conservation Service

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Mines
- Bureau of Reclamation
- Fish and Wildlife Service
- Geological Survey
- Minerals Management Service
- National Park Service

Department of Defense
- U.S. Army Corps of Engineers

Department of Energy

Environmental Protection Agency

Arizona State Agencies

Arizona Commission of Agriculture and Horticulture

Arizona Department of Environmental Quality

Arizona Department of Mines and Mineral Resources

Arizona Department of Transportation

Arizona Game and Fish Department

Arizona Geological Survey

Arizona Mine Inspector's Office

Arizona State Agencies (continued)

Arizona Office of Economic Planning and Development

Arizona State Historic Preservation Office

Arizona Water Resources Department

Governor of Arizona

Local Agencies

City of Safford

Gila Valley Economic Development Foundation

Graham County Board of Supervisors

Graham County Cattle Growers' Association

Graham County Farm Bureau

Graham County Planning and Zoning

Greenlee County Board of Supervisors

Safford Chamber of Commerce

Safford District Advisory Council

Safford Grazing Advisory Board

San Carlos Apache Tribal Council

Town of Clifton

Town of Duncan

Special Interest Groups

American Fisheries Society

American Rivers

Arizona Mining Association

Arizona Toxics Information

Environmental and Earth Science Conservancy

Friends of Arizona Rivers

Maricopa Audubon Society

Mineral Policy Center

National Parks and Conservation Association

The Nature Conservancy

People for the West

Sierra Club

Southwest Wildlands Educational Institute

5.5 Comment Letters and Responses

The comment period for the Draft EIS was scheduled to close on May 11, 1992, but was extended at the request of federal agencies until May 18, 1992. Letters received are listed below.

DATE	DOCUMENT #	NAME OR ORGANIZATION
03/11/92	1	C. D. and N. G. Cochran
03/11/92	2	James & Alyce Whitmire
03/11/92	3	Kenneth & K. Gale Boyd
03/11/92	8	Georgetta Hughes
03/11/92	5	Gwen Hughes
03/20/92	5	Ralph Glidden
03/20/92	7	Department of Mines & Mineral Resources
03/24/92	8	John Savana
03/24/92	9	University of Arizona College of Agriculture
04/26/92	17	USDI, Bureau of Mines
04/26/92	17	Mineral Policy Center
04/08/92	12	Graham County Board of Supervisors
04/10/92	13	Arizona State Parks
04/15/92	17	City of Safford
04/17/92	19	R. B. Schmoller
04/20/92	19	Graham County Board of Supervisors
04/20/92	17	Mineral Policy Center
04/22/92	17	Anne Westenhaver
04/22/92	19	Arizona Department of Agriculture
04/20/92	20	Graham County Chamber of Commerce
05/04/92	21	Edna Zeavin
05/06/92	20	Dr. Ehea Otter
05/06/92	23	Sierra Club, Grand Canyon Chapter
05/06/92	24	Dr. H. G. Wilshire
05/06/92	25	Sierra Club, Palo Verde Group

DATE	DOCUMENT #	NAME OR ORGANIZATION
05/08/92	26	Mineral Policy Center
05/08/92	27	Bill and Lolene Brandau
05/08/92	28	Hearold Elmer
05/11/92	29	David & Sharon Clonts
05/11/92	30	Petition Against Sanchez Road
05/13/92	31	Mansur Johnson
05/18/92	32	USDI National Park Service
05/20/92	33	US Environmental Protection Agency
05/15/92	34	USDI Fish & Wildlife Service
05/21/92	35	USDI Geological Survey
05/18/92	36	Arizona Game & Fish Department
05/20/92	37	Tucson Audubon Society
06/15/92	38	Arizona Department of Environmental Quality
08/20/92	39	Superintendent, San Carlos Agency

The BLM's responses to these letters are presented below. Because many letters addressed common concerns, several general responses have been developed to provide an expanded explanation of these topics:

1. Access Route
2. Hydrology
3. Reclamation Bonding
4. Public Lands
5. Reclamation and Post-Closure Site Management Committee
6. Mining Claims
7. Migratory Bird Netting
8. Clay Liner v. Synthetic Liner

Following the general comments, individual letters have been reprinted with corresponding, specific responses.

General Response No. 1 - Access Route

A major issue identified in public meetings and in comments regarding the Draft EIS is access to the project site. The proposed action was to use the existing Sanchez Road to access the processing facilities and the mine area.

Alternative access routes were evaluated, indicated as Options 1 and 2 in the Draft EIS, which incorporated use of the Solomon Pass Road. BLM held public meetings with Sanchez area residents and Graham County officials, during the Draft EIS preparation and review stages, to resolve this issue. A detailed discussion of this process is included in the Summary of the Final EIS.

The preferred access route developed as a result of these meetings is a combination of the proposed access route and one of the alternative access routes presented in the Draft EIS. Traffic to and from the mine pit and processing facilities will be split between the Sanchez and Solomon Pass roads as follows:

1. All traffic related to the mine and crushing facilities, including workers, maintenance equipment, and supplies, will use the Sanchez Road. After the construction phase, the operational traffic load will be approximately 7 heavy trucks and 71 passenger cars per day.

2. All traffic related to the processing facilities, including plant construction traffic, commuting processing plant workers, acid trucks, cathode trucks, and other processing supply trucks will use the Solomon Pass Road and Option 2, which will be a dedicated processing plant road. After the construction phase, the operational traffic load will be approximately 21 heavy trucks and 18 passenger cars per day.

This combination of Draft EIS alternatives minimizes heavy truck traffic and transportation of hazardous materials on the Sanchez Road, which had been expressed as a major concern. This combination is presented as the preferred alternative in the Final EIS.

The County will make safety improvements to the Sanchez Road, including striping, center reflectors, and appropriate signs for curves and bus stops for approximately five miles of roadway between the intersection with Airport Road and the mine access turn-off to accommodate the additional traffic.

Graham County applied for a road right-of-way to reroute a portion of the Sanchez Road in May 1990.

There are serious safety problems with the existing road which cannot be corrected because of a narrow constriction imposed by canals, power lines, agricultural fields, and scattered residential units. Also, with the prospect of increased traffic from planned mining and recreational developments in the area, it was decided that a new bypass road was the best solution.

The new bypass road, now under construction, will be 5,831 feet long and will have a driving surface of 40 feet. The total right-of-way width, with borrow ditches and cut-and-fill slopes, varies from 100 to 120 feet. This new road will provide safe access for the heavy traffic associated with the proposed AZCO copper mine as well as a more direct route to the Bonita Creek area. This will allow the bypassed portion of the old Sanchez Road to revert to a dead-end lane for local traffic. Three-quarters of the road has been rough constructed, with only the final surfacing remaining to be completed on this portion. The remaining portion yet to be build (from the old landing strip east to the intersection with the old Sanchez Road) will likely require another one to two years to construct.

The Solomon Pass Road is gravel from the airport north and will need modifications to carry the mine traffic described above. The BLM and Graham County have agreed to modify and improve the Solomon Pass Road from its junction with Airport Road, for approximately three miles, to the proposed access road for the processing facility (Draft EIS Option 2). Improvements will consist of an upgrade of the existing roadway to safely carry the increased heavy truck traffic. AZCO will be responsible for construction and maintenance of the access road from the Solomon Pass Road to the processing facilities.

General Response No. 2 - Hydrology

Additional hydrological studies (including pump tests) were conducted since publication of the Draft EIS [Geothermal Surveys, Inc., reports dated August 1992]. The studies indicate that there are up to four separate aquifers in or near the project area:

- Upper Gila Conglomerate aquifer in the open pit area;
- Lower Gila Conglomerate aquifer in the basal conglomerate under the valley fill;
- Bedrock aquifer in the fractured igneous bedrock; and
- Upper Gila aquifer in the sediments along the Gila River, south of the project.

The extreme southern edge of the open pit will intersect a maximum of 85 feet of saturated Upper Gila Conglomerate aquifer. The open pit will also intersect approximately 1,000 feet of the Bedrock aquifer.

Neither the Upper Gila nor Lower Gila Conglomerate aquifer is present in the area of the open pit. Previous studies indicate that the Lower Gila Conglomerate aquifer may be present under the lacustrine clays in the leach pad area. Although not confirmed, a shallow aquifer similar to the Upper Gila Conglomerate aquifer probably underlies a portion of the waste dump area.

The hydrological studies indicate that the probable range of inflow to the pit from the Upper Gila Conglomerate and Bedrock aquifers is 9 to 250 gallons per minute (gpm), with 135 gpm being most likely. With the planned diversion of ephemeral surface water around the pit, the net loss to evaporation (precipitation - evaporation) is over 700 gpm on an annual-average basis. Evaporation exceeds predicted inflows, and no permanent ponding is anticipated in the pit. Since rainfall is often concentrated in wet periods, ephemeral ponding can be expected. This water would be primarily rain water, but can be expected to contain soluble salts deposited on the pit walls by the evaporation of groundwater seepage. As the pond evaporates, these salts would become more concentrated and would eventually be deposited in the pit bottom.

The rock in the pit walls has low acid-generating potential and high acid-neutralizing potential [Mining & Environmental Consultants, Inc., Report on Waste Material Testing, May 1992]. The ponded water would therefore not be expected to become acidic or leach metals from the pit walls. There are no indications that the ponded water would be toxic to birds or other wildlife.

Since the quantity of water which would seep from the aquifers into the pit is small, no measurable effect on the Upper Gila aquifer is predicted [Geothermal Surveys, Inc., August 1992]. Ponded water will not seep into the Bedrock aquifer since the direction of flow is from the aquifer into the pit.

AZCO has proposed installation of water supply wells south of the open pit. These wells would draw water primarily from the Upper Gila aquifer. The hydrological studies indicated that with the exception of two wells within 1,000 feet of the water supply wells, the draw-down after 17 years of pumping in other wells within one mile would be 11 feet or less. The effect on wells beyond one mile would be negligible.

The general strategy for dealing with surface water is to:

1. Divert runoff from undisturbed areas around project facilities and back into the major watercourse that would have received the flow without the diversion;
2. Capture and use precipitation falling on the pit, leach pad and ponds; and
3. Capture runoff from disturbed areas in runoff collection ponds and allow it to infiltrate or evaporate.

All diversion channels and water retention structures will be designed to handle a storm greater than the 100-year, 24-hour event. At mine closure, the BLM will designate those runoff control structures to be reclaimed and those to be improved to assure long-term stability.

General Response No. 3 - Reclamation Bonding

AZCO will be responsible for all reclamation costs. Mining operators on public (i.e., BLM) lands must post a reclamation bond for land-disturbing activities as a condition of approval for their mining plans. This bond is held by the BLM and is not released until the reclamation as described in the mining plan is successfully completed. In AZCO's case, this would include a successful re-establishment of vegetation and ensuring that the open pit, leach pads, and the waste rock pile are environmentally benign. In the event that an operator abandons a project without proper reclamation, they would forfeit the bond, and the money would be used by the BLM to hire contractors to reclaim the site.

As noted on page 2-43 of this document, because of the long mine life of the AZCO project, it has been decided that their bond amount will be based on three-year increments. That is, the initial bond amount will be based on projected disturbances occurring during the first three years of the mine life, and will be adjusted accordingly using this same criteria each third year throughout the life of the mine. The overall bond amount is shown as Appendix A; the initial 3-year bond amount is shown as Appendix B.

The total bond amount was increased by nearly 50% over the proposal in the Draft EIS; this increase is reflected in the initial 3-year bond amount.

General Response No. 4 - Public Lands

As stated in the Mining and Minerals Policy Act of 1970, reflected in the Federal Land Policy and Management Act (FLPMA) of 1976, and reiterated in the National Materials and Minerals Policy, Research and Development Act of 1980, "it is the continuing policy of the Federal Government to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The BLM recognizes that public lands are an important source of the Nation's mineral and energy resources. BLM is responsible for making public lands available for orderly and efficient development of these resources under principles of balanced multiple-use management. As such, the BLM actively encourages and facilitates the

development by private industry of public land mineral resources in a manner that satisfies national and local needs and provides for economically and environmentally sound exploration, extraction, and reclamation practices" (BLM Manual 3000.06).

General Response No. 5 - Reclamation and Post-Closure Site Management Committee

The BLM Gila Resource Area will organize a committee composed of AZCO officials, BLM specialists, local government representatives, and interested citizens to review the long-term management and associated reclamation needs of the project site. This committee is expected to form approximately five years prior to the end of the mine life (see Final EIS, page 2-36). The goal of this committee will be to formulate a long-term management strategy for the site following mine closure. This will include consideration of the local community's land use needs, reclamation measures and resource values. In the meantime, AZCO will proceed with its revegetation test plots, and conduct concurrent reclamation on areas no longer needed for operations, such as completed portions of the waste dump. The goal of revegetation is to restore the existing plant community to its present condition or better. As mentioned on page 2-35 of the Draft EIS (page 2-39 for Final EIS), a plant salvaging program is required by Arizona state law.

The reclamation committee will evaluate the results of AZCO's salvaging efforts, test plots, and concurrent reclamation as described in the mining plan as a guideline for final reclamation requirements.

The committee will also review on-going research on appropriate reclamation techniques for mine sites in the western United States. Some organizations researching revegetation of mined lands include the U.S. Department of Agriculture's Intermountain Research Station in Logan, Utah; the University of Wyoming; and Colorado State University (Bioscience, v. 41, no. 2, p. 68). Another example of on-going reclamation research is the relatively new technique of "landshaping" mined-out pits, where "custom" blasting is used to mold selective bench edges, high walls, and the pit rim to create natural-looking talus slopes and slopes of gently increasing steepness. This allows increased revegetation and foraging animals to access the reclaimed pit. As discussed elsewhere in this document (page 2-51 of the Final EIS), a partial back-filling alternative for the pit is being considered.

General Response No. 6 - Mining Claims

The Mining Law of 1872, as amended, imparts a certain degree of management constraint, since actions under this law are nondiscretionary. A claimant has a possessory right to develop and extract minerals. Only unnecessary or undue environmental degradation, or conflicts with other laws, most notably the Endangered Species Act and the National Historic Preservation Act, can interfere with such rights. Mining claims and sites are real property. The interests in them and associated rights may be bought, sold, willed, or inherited. The claimant or operator is not required to pay for surface resources disturbed or removed while conducting necessary and due operations. Similarly, because mining claims are real property with associated rights, the claimant or operator cannot be required to buy or improve other lands as a condition to working the claims.

General Response No. 7 - Migratory Bird Netting

The expansion of gold heap leaching in the western states has created large ponds of water in arid areas. Such ponds have sometimes been located along migratory bird flyways and have attracted birds. Solutions in these ponds contain varying levels of cyanide, which can be fatal to these birds.

The U.S. Fish and Wildlife Service has primary jurisdiction for the enforcement of the Migratory Bird Treaty Act which states that ". . .except as permitted by regulation . . . it shall be unlawful at any time, by any means or in any manner, to . . . kill . . . any migratory bird." Based upon this Act, it is the position of the U.S. Fish and Wildlife Service that the only acceptable level of migratory bird mortality is zero.

Solution containment and transfer structures, including ditches, ponds and tailings impoundments which contain levels of cyanide lethal to migratory birds must be designed and operated in a manner which prevents access and mortality.

The solution ponds at the Sanchez Project will contain copper sulfate. (See Section 2.1.6.2.) There are several major copper sulfate tailings ponds in Arizona which cover hundreds of acres. These solution ponds are open to migratory birds and other shore birds which may be year round residents. To date, there have been no reported migratory bird mortalities on any copper sulfate solution ponds in Arizona. Major copper companies in Arizona were contacted directly to determine if they had experienced problems with mortalities in the ponds. None of the company personnel contacted have

observed bird fatalities associated with copper recovery solution ponds, even though no netting is used. Therefore, no netting will initially be required for the Sanchez Project. If there are any observed mortalities of regulated migratory birds, then as mentioned on page 2-23 of this document, the ponds will be covered with nets. The BLM and Arizona Game and Fish Department will monitor the project for wildlife mortalities.

General Response No. 8 - Clay Liner v. Synthetic Liner

For optimum effectiveness, liners must be designed as an integral liner system, taking into consideration the application and local conditions. Liner systems may consist of a single liner, multiple liners, or a composite liner, with or without leak detection/collection features. Liners are commonly constructed of natural soils, synthetic materials including plastic membranes, asphalt and concrete, or a combination of natural soils and synthetic materials. The liner system most appropriate for a particular application depends on a number of factors including the hydraulic head, solution characteristics, and the destructive forces to which the liner will be subjected. Since a major function of a liner is to prevent contamination of groundwater, the State of Arizona also allows consideration of the hydrogeological setting when determining which liner systems are suitable for a particular application.

Various liner systems were considered for the Sanchez Project solution containment structures. The solution pond liners will be subjected to high hydraulic heads but little mechanical stress. In this case, small liner defects could result in relatively large solution losses. For the ponds, a system consisting of a 60-mil synthetic primary liner, an integral leak detection/collection layer, and a 40-mil synthetic secondary liner was selected. The external solution ditches may be subject to a moderate hydraulic head and a higher risk of mechanical damage. A composite liner consisting of an 80-mil synthetic membrane over 12 inches of compacted clay with an integral leak detection/collection layer was selected for this application. For the leach pad, with its low hydraulic head (less than 12 inches), a single liner composed of three separate layers of compacted clay over a prepared subgrade was selected.

The Arizona Department of Environmental Quality (DEQ) specifically allows for the use of a single, natural soil liner over a prepared subgrade for base metals heap leach pads. This liner system, when considered with site conditions, constitutes Best Available Demonstrated Control Technology (BADCT) as defined by the Arizona DEQ.

A large deposit of lacustrine silts and clays is present on the project site. This clay has been tested by the leach pad design firm, Vector Engineering, Inc. (Vector) and others, to confirm its permeability and compatibility with the leach solution. Arizona DEQ suggests a permeability of 1×10^{-6} or 1×10^{-7} cm/sec, depending on the application, for new natural soils liners. Tests on remolded samples of the proposed material yielded an average permeability of 3.3×10^{-7} cm/sec with water as the permeant. With simulated acidic leach solution, the permeabilities of remolded samples averaged 1.3×10^{-8} cm/sec. Vector concluded that local clay/silt materials can be used to construct the pad liner and should achieve permeabilities of less than 10^{-7} cm/sec with pregnant leach solution if compacted to specification.

The hydrogeological setting of the Sanchez site is favorable for leach pad construction since it provides a high degree of hydrological isolation of the leach pad from groundwater. The Sanchez leach pad site is underlain by a layer of cemented alluvium up to approximately 50 feet thick and a layer of lacustrine clays and silts up to approximately 600 feet thick. These layers act as a secondary liner between the primary liner and groundwater. In-situ tests with water indicated an average permeability of 1.7×10^{-5} cm/sec in the clay/silt layer. Column tests conducted on crushed samples of this material indicated that the permeability decreases by a factor of over 3.5 when the permeant is leach solution rather than water. A permeability of 1×10^{-5} cm/sec is therefore considered conservative. This material also has a high acid-neutralization potential. A composite sample indicated a neutralization potential of approximately 1400 pounds of acid per ton.

With the low permeability and great thickness of the layers under the leach pad, the time required for seepage from the primary liner to reach groundwater far exceeds the life of the project. Because of the high acid-neutralizing capacity of these layers, the leach solution will be neutralized and the contained metals precipitated as insoluble hydroxides within a few feet. Once operations have ceased, the downward migration of the neutralized solution will cease due to the water retention capability of the silts and clays. The result is that pad seepage will never reach groundwater.

Public Comment Letters and Specific Responses

During the public comment period for the Draft EIS, the following letters were received. These letters have been photocopied for inclusion in the Final EIS. The BLM has incorporated specific responses to comments not addressed in the preceding General Responses.

Letter 1

Mr. Larry Thrasher
BLM Project Manager
Safford District Office
425 E. 4th St.
Safford, Arizona 85546

Sir;

1-1 Upon recent reading of the AZCC mine DEIS I am encouraged by the thouroghness of the site sensitive studies addresses to date.

It becomes apparent to my wife and myself that both the Bureau of Land Management and AZCC have gone the extra mile to insure species protection and site reclamation issues are addressed in an ongoing long term mitigation process.

This mine exemplifies the growing awareness in America of the ability we have to work together to keep our national public lands resource industries strong and responsible at the same time.

This mine will benefit the communities in the region in ways they have been needing for years. So, yes sir, go on with this project, use the good management regulations currently in place and we feel this can be a fine precedent for citizen participation in the future stewardship functions of our public lands.

Citizens,
C.D. Cochran N.G. Cochran
C.D. Cochran N.G. Cochran
732 W. Swift Trail
Safford, Arizona 85546

Response to Letter 1

1-1 Thank you for your comments.

Letter 2

Dear Sir: 3-11-92

2-1 We both suport the AZCO mine

Mr James Whitmire
Mrs. Alyce Whitmire

Safford, Arizona

Response to Letter 2

2-1 Thank you for your comment.

Letter 3

3-10-92

Mr. Thrasher,

3-1 We support the AZCO Mining project above San Jose. In our opinion, given the current economic situation, the positive aspects would outweigh the minimal negative impact.

3-2 We further believe that an upper access would be preferable to using the existing access.

Thank you,

Kenneth W. Boyd

K. Gale Boyd

8414 S. Hwy 666

Safford, Az 85546

Response to Letter 3

3-1 Thank you for your comment.

3-2 Please refer to General Response No. 1 - Access Route.

Letter 4

Larry Thasher, BLM
AZCO Project Manager
425 E. 4th
Safford, AZ 85546

Dear Mr. Thasher,

4-1 I support the AZCO Mine Project but would suggest a new access road rather than using the existing road.

Thanks,

Georgetta Hughes

Georgetta Hughes
2204 9th Ave.
Safford, AZ 85546

Response to Letter 4

4-1 Thank you for your comment. Please refer to General Response No. 1 - Access Route.

Letter 5

Larry Thasher, BLM
AZCO Project Manager
425 E. 4th
Safford, AZ 85546

Dear Mr. Thasher,

5-1 I support the AZCO Mine Project but would suggest a new access road rather than using the existing road.

Thanks,

M. G. Hughes
Gwen Hughes
2204 9th Ave.
Safford, AZ 85546

Response to Letter 5

5-1 Thank you for your comment. Please refer to General Response No. 1 - Access Route.

Letter 6

Ralph Glidden   Box 1097   Cooke City, Montana   59020

March 19, 1992

RE: Comments on Draft EIS - Sanchez Copper Project

Larry Thrasher, Project Manager
Safford District Office
Bureau of Land Management
425 East 4th Street
Safford, Arizona 85546

Dear Mr. Thrasher:

I have reviewed the draft EIS for the Sanchez Copper Project and wish to submit the following comments:

<u>Pit Dewatering</u>:

6-1 The potential water inflow rate into the pit is estimated at 200 to 500 gpm. The draft EIS should include a discussion of the potential negative long-term impacts to water quality and wildlife that might result from partial water-filling of the pit after closure. The Reclamation and Closure Plan should analyze a possible mitigating long-term pit dewatering program.

<u>Waste Rock Disposal</u>:

6-2 The waste rock disposal area will be unlined and could pose a significant threat to water quality. According to results from leach tests, TCLP test, and additional tests recommended by ADEQ, on average, less than 0.10% sulfide content is expected in the material from the pit. Since acid drainage is a significant concern, additional thorough and comprehensive sampling and static geochemical testing should be conducted to provide extensive analysis of acid-base potential.

Thank you for the opportunity to comment on this draft EIS.

Sincerely,

Ralph Glidden

Ralph Glidden

Response to Letter 6

6-1 See General Response No. 2 - Hydrology, as well as revised Section 3.3 and revised Section 4.3.

6-2 See revised Section 3.2.1 and new Appendix C - Report on Waste Material Testing, which demonstrates that the waste rock will not generate acid or heavy metals in excess of Arizona DEQ water quality standards.

Letter 7

STATE OF ARIZONA
DEPARTMENT OF MINES AND MINERAL RESOURCES
ARIZONA MINING AND MINERAL MUSEUM
Phone (602) 255-3791 1-800-446-4259 (IN ARIZONA ONLY)
FAX (602) 255-3777 Tucson Field Office (602) 628-6340

March 15, 1992

Mr. Larry Thrasher
BLM Project Manager
Safford District Office
425 E. 4th Street
Safford, AZ 85546

Dear Mr. Thrasher:

RE: Draft Environmental Impact Statement
Sanchez Copper Project 3809 AZA 25564(044)

7-1 Thank you for this opportunity to comment on the referenced document.

The advantage of the proposed operation is obvious to the reader. The productivity of the land in wages, taxes and in promoting the self-sufficiency of the U. S. economy in the short run far outweighs any percieved adverse effects. The long run productivity of the land will not be reduced and may even be enhanced by this project and the mitigation efforts that are committed by it. I strongly recommend that the project be allowed to proceed as soon as possible.

7-2 Although this document is generally well done I will point out one minor erroneous assumption. In paragraph 4.14 it is stated that resources consumed "(eg. fuel, electricity, reagents) would not be consumed" under the No Action alternative. This is untrue. The same amount of copper will be consumed by the world economy regardless of the fate of this project and therefore those resources would still be consumed in lesser or greater amounts at some other location to produce an equivalent amount of copper.

7-3 Also the maps in Figures 1-1 and 1-2 include portions of several counties other than Graham (Greenlee, Cochise, Pima, Pinal and Gila). These maps would be much clearer if the county boundaries were shown.

Sincerely,

Richard R. Beard
Mining Engineer

RRB:mc

1502 WEST WASHINGTON STREET, PHOENIX, ARIZONA 85007-3210

Response to Letter 7

7-1 Thank you for your comment.

7-2 Section 4.14 in the Final EIS has been revised in response to your comment.

7-3 County boundaries have been added to Figure 1-1.

Letter 8

March 15, 1992

BLM
Safford District Office
425 E. 4th St.
Safford, AZ 85546

Dear Ms. Jensen:

8-1 Thank you for sending the AZCO DEIS to me. I read it and hope you will support the No Action Alternative. The air pollution resulting from this development is a threat to the area.

Thank you.

Sincerely,
John Savarese
74 Mobile Ave.
Staten Island
NY 1038

Response to Letter 8

8-1 The project must and will comply with all state and federal air quality standards. These standards are regulated and enforced by the Arizona Department of Environmental Quality.

Letter 9

College of Agriculture
School of Renewable Natural Resources

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA

Ms. Margaret Jensen
USDI, Bureau of Land Management
Gila Resource Area
425 E. 4th Street
Safford, Arizona 85546

Dear Meg:

This is to follow up our short conversations on Friday March 20 about the Sanchez draft EIS.

I used the draft in my class WSM 468/568 "Wildland Water Quality" as a take-off point to invoke discussion on how to read water quality data, and with a with a suspicious eye. How to look out for the unusual and the (perhaps) erroneous items, the typos and the eyebrow-raisers.

9-1 Re table 3-5. Summary of Water quality data from Selected wells:

1. Note the unusual EC presentation. For some reason, they've been divided by a factor of 10, as explained in footnote "a". What's shown here as 240 would customarily be shown in µmho/cn as 2400. This confuses.

2. Fluorides are high on a national or regional comparison. But the Safford basin is know for a fluoride problem.

3. What's with the 130 mg/L for Nitrates for D(6-27) 16caa? Awfully high. If it's true it should be noted in the text and explained. On the other hand, it could be off by a factor of 10; should really read 13.0? Read on.....

   Also note the 1700 EC value, which is actually 17000 µmhos/cm, the usual units of presentation. Suspect this is a misprint, and it should really be 170 by their notation. Summing the ions (with the 51% discount of bicarbonates to simulate the drying to residue) suggests a TDS of about 840 mg/L. This would be more in keeping with an EC of 1700 (170 by their notation), insofar as the TDS/EC comes out to .49. This is lower than expected, so perhaps the nitrates really are at 130. If the nitrates really were at 130 then TDS would be about 970, or TDS/EC of 0.57, a credible figure given the TDS/EC for the rest of the table.

4. Note the age of the data. Goes all the way back to 1940. Only three (3) lines from the 1980's. The older stuff is how it was then, and may or may not have been done with the accuracy of the 1980's work.

Response to Letter 9

9-1 This table was reprinted from the SHB Preliminary Permitting Studies Report. As your letter illustrates, typographical errors and apparent discrepancies do occur in the presentation of large quantities of data. This table is a compilation of several historical reports and is intended as an overview tool. New hydrologic quality and quantity sampling of existing wells has been performed and is now presented in Section 3.3.

Letter 9 continued

5. Overall high TDS (Total Dissolved Solids) compared to surface waters. Check it out against standards.

6. Nothing unusual in the pH column except the one instance of pH=6.9.

7. Note the 59.0 Celsius sample. This is 138.2 Fahrenheit. It invites comment somewhere. It's obviously a hot spring.

8. The lumping of Sodium + Potassium prevents a clear check on the ion balance check. However, I split them out at a Na/K ratio estimated at 9/1, and ran the ion balance on the three most complete samples in the Table. The results are shown on the attached sheets. They seem to balance well, and my hardness values check well with theirs.

Also ran the check on the previously described 1982 sample with the 130 mg/L of nitrates. It checks out.

9-2 Also, see Table 3-8. Bonita Creek Water Quality Data, attributed to Minckley and Sommerfelt. The mean magnesium is given as 0.0164 mg/L. Suspect this to be a typo; should be 16.4? Even using 16.4 for the magnesium, we're a lttle short on cations. See the enclosed balance sheet.

9-3 We talked about the size of the hole, the depth of the hole, and the obvious problem vis-a-vis the proximity to the Gila River, but went no further. One student asked about the quality of runoff expected from the leach pads etc., and where it would go.

I think the date was Tuesday March 10, 1992, and we spent about a half an hour on it. That's as far as we went. Hope it's of some interest to you.

Sincerely,

Pete

Richard H. Hawkins
Professor

sandbez.memo

Response to Letter 9

9-2 Bonita Creek data has been removed from the Final EIS. Bonita Creek is located several miles upstream from the project and will not be affected by this project.

9-3 Please refer to General Response No. 2 - Hydrology. Runoff from the leach pads will be channeled to the solution ponds via lined ditches.

```
D(7-27)8ba  7-30-41

Cation   mg/L    meq/L   Anion    mg/L    meq/L
---------------------------------------------------
Na      231.30  10.0616  Cl      322.00   9.0836
Ca       98.00   4.8902  SO4     152.00   3.1646
K        25.70   0.6574  HCO3    359.00   5.8840
Mg       28.00   2.3041  NO3       9.90   0.1597
Li       -0.00  -0.0000  PO4      -0.00  -0.0000
          0.00   0.0000  F         1.80   0.0948
---------------------------------------------------
Total   383.00  17.9133          844.70  18.3867

 Calculated sum of above ions          = 1045.33   mg/L
    Non-ionic Silica                   =   -0.00   mg/L
    Total Dissolved Solids (calc)      = 1045.33   mg/L
Equilvalents balance (Cations-Anions) =   -0.4734 epm
                      Imbalance percent =   -1.30   %

     Total hardness  as CaCO3          =  359.72   mg/L
  Alkalinity (Carbonate Hardness)      =  294.45   mg/L
          Non-Carbonate Hardness       =   65.26   mg/L

  TDS/Conductivity =1045.3/ 1600.0     =    0.6533
         Transport rate                =   -0.0000  Tons/day
```

— ck USGS data Jan + 3 16

d(627)35dd

Cation	mg/L	meq/L	Anion	mg/L	meq/L
Na	197.20	8.5782	Cl	248.00	6.9961
Ca	78.00	3.8922	SO4	113.00	2.3527
K	20.80	0.5321	HCO3	317.00	5.1956
Mg	22.00	1.8104	NO3	1.00	0.0161
Li	-0.00	-0.0000	PO4	-0.00	-0.0000
	0.00	0.0000	F	2.90	0.1527
Total	318.00	14.8128		681.90	14.7132

Calculated sum of above ions	=	838.86	mg/L
Non-ionic Silica	=	-0.00	mg/L
Total Dissolved Solids (calc)	=	838.86	mg/L
Equilvalents balance (Cations-Anions)	=	0.0997	epm
Imbalance percent	=	0.34	%
Total hardness as CaCO3	=	285.13	mg/L
Alkalinity (Carbonate Hardness)	=	260.00	mg/L
Non-Carbonate Hardness	=	25.13	mg/L
TDS/Conductivity = 838.9/ 1380.0	=	0.6079	
Transport rate	=	-0.0000	Tons/day

D(6-27)34dcc

Cation	mg/L	meq/L	Anion	mg/L	meq/L
Na	294.30	12.8020	Cl	410.00	11.5661
Ca	118.00	5.8882	SO4	200.00	4.1640
K	32.70	0.8365	HCO3	415.00	6.8018
Mg	37.00	3.0447	NO3	34.50	0.5565
Li	0.00	0.0000	PO4	-0.00	-0.0000
	0.00	0.0000	F	2.50	0.1316
Total	482.00	22.5714		1062.00	23.2200

Calculated sum of above ions	=	1333.18	mg/L
Non-ionic Silica	=	-0.00	mg/L
Total Dissolved Solids (calc)	=	1333.18	mg/L
Equilvalents balance (Cations-Anions)	=	-0.6486	epm
Imbalance percent	=	-1.42	%
Total hardness as CaCO3	=	446.65	mg/L
Alkalinity (Carbonate Hardness)	=	340.38	mg/L
Non-Carbonate Hardness	=	106.26	mg/L
TDS/Conductivity =1333.2/ 2400.0	=	0.5555	
Transport rate	=	-0.0000	Tons/day

d(6-27)16caa 1982

Cation	mg/L	meq/L	Anion	mg/L	meq/L
Na	64.80	2.8188	Cl	130.00	3.6673
Ca	180.00	8.9820	SO4	250.00	5.2050
K	7.20	0.1842	HCO3	323.00	5.2940
Mg	46.00	3.7853	NO3	130.00	2.0969
Li	-0.00	-0.0000	PO4	-0.00	-0.0000
	0.00	0.0000	F	0.20	0.0105
Total	298.00	15.7703		833.20	16.2737

Calculated sum of above ions	=	967.12	mg/L
Non-ionic Silica	=	-0.00	mg/L
Total Dissolved Solids (calc)	=	967.12	mg/L
Equivalents balance (Cations-Anions)	=	-0.5034	epm
Imbalance percent	=	-1.57	% – ok w/ NO3 @ 130mg/L
Total hardness as CaCO3	=	638.37	mg/L
Alkalinity (Carbonate Hardness)	=	264.92	mg/L
Non-Carbonate Hardness	=	373.44	mg/L
TDS/Conductivity = 967.1/ 1700.0	=	0.5689 – ok	
Transport rate	=	-0.0000	Tons/day

Bonita Minckley Averages

Cation	mg/L	meq/L	Anion	mg/L	meq/L
Na	22.50	0.9787	Cl	15.00	0.4232
Ca	34.00	1.6966	SO4	8.70	0.1811
K	3.50	0.0895	HCO3	245.06	4.0165
Mg	16.40	1.3496	NO3	0.02	0.0003
Li	-0.00	-0.0000	PO4	1.10	0.0347
	0.00	0.0000	F	0.75	0.0395
Total	76.40	4.1144		270.63	4.6954

Calculated sum of above ions	=	222.54	mg/L
Non-ionic Silica	=	-0.00	mg/L
Total Dissolved Solids (calc)	=	222.54	mg/L
Equilvalents balance (Cations-Anions)	=	~~-0.5809~~	~~epm~~
Imbalance percent	=	-6.59	%
Total hardness as CaCO3	=	152.31	mg/L
Alkalinity (Carbonate Hardness)	=	201.00	mg/L
Non-Carbonate Hardness	=	0.00	mg/L
TDS/Conductivity = 222.5/ 313.0	=	0.7110	
Transport rate	=	-0.0000	Tons/day

OK, but not great

Preliminary Permitting Studies
Sanchez Copper Project
Near Safford Arizona
SHB Job No. E89-54

Table 3-5
Summary of Water Quality Data
From Selected Wells

(Concentrations of Constituents are in milligrams/liter, except as noted)

Well Location	Well Depth (feet)	Date Sampled	Calcium	Magnesium	Sodium + Potassium K	Chloride	Bicarbonate	Sulfate	Fluoride	Nitrate	T.D.S.	EC at 25 C TDS/EC	pH	Temperature C	Hardness as CaCO
0(6-26)23dad	587	2-1-60	58	5	1081	1152	185	700	--	--	3234	--	7.8	--	144
0(6-26)25bcc	1000	1-27-60	26	5	800	286	168	1150	--	--	2563	--	8.0	--	64
0(6-26)25dbb	1022	12-21-59	22	3	683	308	217	900	--	--	2183	--	8.0	--	56
0(6-26)26acb	950	1-16-60	135	34	1399	234	146	2880	--	--	4857	--	8.2	--	338
0(6-27)16cb	50	2-17-41	112	24	36	12	375	123	1.3	0.2	494	77	--	--	378
0(6-27)16cbd	290	2-20-63	--	--	--	180	--	--	--	--	1130	--	7.2	--	--
0(6-27)16cca	--	1982	180	46	72 64.8 7.2	130	323	250	0.2	130	--	1700	6.9	23	--
0(6-27)19abc	433	11-12-59	212	34	1560	2128	176	860	3.5	--	5031	--	7.1	--	530
0(6-27)19cbc	615	12-1-59	192	7	1651	2166	168	850	1.8	--	5098	--	7.8	--	508
0(6-27)30aac	542	11-20-59	53	7	656	822	232	220	2.5	--	2045	--	7.7	41.1	132
0(6-27)30cdd	1074	1-05-60	26	6	651	350	217	820	--	--	2085	--	7.7	36.1	64
0(6-27)31dcc	1400	1-21-63	--	--	--	835	--	--	--	--	2530	--	8.1	36.1	--
0(6-27)34dcc	--	7-1972	118	37	327 149.3 22.7	410	415	200	2.5	34.5	1544	240	7.4	--	--
0(6-27)35ac	52	7-15-40	--	--	--	200	287	--	--	--	864	120	--	--	142
0(6-27)35ad	14	5-23-40	50	15	253	232	271	--	--	--	--	152	--	--	152
0(6-27)35bcc	1000	1-21-63	--	--	--	555	--	--	--	--	1865	--	8.8	--	--
0(6-27)35dd	--	9-9-41	78	22	208 187.2 20.8	248	317	113	2.9	1.0	829	138	--	--	285
0(6-27)35ddd	--	7-1972	4	0.5	237	228	200	120	7.0	6.0	814	143	8.7	--	--
0(6-27)36ccc	--	7-1972	5.6	0.5	320	246	254	105	2.9	20.3	956	151	7.6	--	--
0(6-28)31aa	57	7-29-41	58	15	98	118	247	44	1.3	0.8	457	83	--	--	206
0(6-28)31ada	--	7-1972	100	21	193	372	210	80	1.3	7.5	985	165	8.6	--	--
0(6-28)31ccb	--	7-1972	118	29	155	242	298	120	1.2	22.5	984	145	7.8	--	--
0(6-28)31dac	--	7-1972	70	18	167	252	237	70	1.3	--	817	130 1628	7.6	--	--
0(6-28)31dba	48	7-30-86	47	11	103 99.7 103	110	--	61	1.6	--	480	950 .505	7.5	19.5	160
0(6-28)31dba	--	7-1972	31	9	200	214	224	100	1.9	6.0	785	125 .628	8.6	--	--
0(6-28)31dbd	--	7-1972	74	16	144	212	232	75	1.3	9.0	763	120 .635	7.8	--	--
0(7-26)04baa	--	7-29-86	140	8	2816	3000	--	1700	7.6	--	7700	12,500 .616	8.0	59.0	380
0(7-26)12dc	--	9-10-41	110	29	229	328	344	133	1.6	5.0	1005	174	--	--	396
0(7-26)12dd	14	5-21-40	48	32	254	342	127	209	--	--	948	160	--	--	251
0(7-27)04daa	--	7-1972	101	23	217	246	337	120	1.8	18	1064	168	7.6	--	--
0(7-27)07ddd	--	7-1972	106	24	203	270	366	250	1.9	24.8	1246	200	7.6	--	--
0(7-27)08add	--	7-1972	109	29	205	344	366	190	2.1	36	1281	205	7.6	--	--
0(7-27)08dbb	--	7-1972	124	29	280	370	366	290	2.1	--	1371	220	7.6	--	--
0(7-27)09abb	--	7-1972	114	27	235	332	356	160	1.6	21.8	1248	180	7.5	--	--
0(7-27)4ad	81	6-20-40	--	--	--	270	335	--	--	--	--	151	--	--	232
0(7-27)5aaa	1275	2-19-63	--	--	--	575	--	--	--	--	1670	--	8.3	--	--
0(7-27)7dd	21	2-27-42	--	--	-- 231.3	700	278	--	--	--	--	335	--	--	248
0(7-27)7dd	--	6-20-40	--	--	-- 25.7	240	392	--	--	--	--	128	--	--	120
0(7-27)8ba	--	7-30-41	98	28	257	322	359	152	1.8	9.9	1046	160	--	--	360
0(7-27)9da	81	6-20-40	--	--	--	240	278	--	--	--	--	151	--	--	248

Notes:
a. Electrical conductivity = K X 10 at 25 C
b. Specific conductivity in microsiemens per centimeter at 25 C
c. Analysis for 1959, 1960 & 1972 samples are sodium only

Reference:
U.S.G.S. (unpub.) for 1959, 1960 data
Hem (1950) for 1940-1941 data
Wilson and Garrett (1988) for 1986 data
Muller (1973) for 1972 data
Hassemer and others (1983) for 1982 data

3-23

Letter 10

United States Department of the Interior

BUREAU OF MINES
Intermountain Field Operations Center
P.O. Box 25086
Building 20, Denver Federal Center
Denver, Colorado 80225

April 2, 1992

Memorandum

To: Ray A. Brady, District Manager, Safford District Office, Bureau of Land Management, 425 E. 4th Street, Safford, AZ 85546

From: Acting Chief, Intermountain Field Operations Center

Subject: Draft Environmental Impact Statement for the Sanchez Copper Project

As you requested, personnel of the Bureau of Mines reviewed the subject document. With regard to the National Environmental Policy Act, our consultive role in reviewing such documents is to determine whether mineral resource impacts have been adequately considered during project planning. In this particular instance, our review of the document has the goal of determining whether impacts to mineral resources other than copper have been adequately considered.

10-1 The document indicates that copper will be recovered at the mine using heap leaching and solvent extraction/electrowining. Future versions of the document should discuss whether molybdenum (present as molybdenite - p. 3-11) will also be recovered as a byproduct and whether any other byproducts often associated with copper porphyry systems (such as gold and silver) are present in sufficient quantities to be recovered.

B. B. Williams
For Richard B. Grabowski

Response to Letter 10

10-1 As indicated by McColly and Anderson (1987, p.25), the Sanchez ore body is in one of the very few metallic mining districts in Arizona to have only copper as an identified resource. Nearly all the other such districts, totaling over 100, have gold, silver, lead, molybdenum, or zinc identified along with copper as resources. As indicated on page 3-11 of the Draft EIS, molybdenite is virtually absent in the oxidized zone and occurs in very minute quantities in the transitional zone ("mixed zone") between the oxidized and sulfide zones, over 1,000 feet below the surface.

AZCO thus has no plans for recovering any commodities other than copper.

Letter 11

MINERAL POLICY CENTER

• P. O. BOX 2998 • DURANGO, COLORADO • 81302 • 303-385-6751 •

March 31, 1992

U.S.D.I. Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, AZ 85546

Attention: Meg Jensen

Re: AZCO Mining Co./Sanchez Copper Project

Dear Meg:

11-1 On page 18 of AZCO's Plan of Operations, under the heading "Waste Rock Disposal," reference is made to a "30-day column leaching test...performed by Metcon Research Inc. on 60 lbs. of waste material," with citation to the Metcon Research report dated October 4, 1989. See table of references at end of MPO.

However, I am unable to find any reference to this report or its conclusions in the text of AZCO's Draft Environmental Impact Statement (although it does appear in the list of references at the end of the document). The "Waste Rock Disposal" section on pp. 2-8 and -9 of the Draft EIS omits the Metcon citation, and while the "Water Resources" section of Part 4.0 of the Draft EIS mentions certain leach testing apparently performed on samples taken from the project area (see p. 4-9), again, no express reference is made to Metcon Research's report or, for that matter, any other leach test reports.

11-2 From the standpoint of assessing risks to surface and groundwater, the methodologies, procedures and results of sampling techniques and leach tests performed on materials from the project area are absolutely critical. Unless all aspects of leach tests and sampling for this project are disclosed, there is no way either the BLM or the public can comment on the sufficiency of the Draft EIS or the accuracy of its conclusion of "no significant impact" on water resources (see p. 4-12), or independently assess the risks the project may present to those resources.

11-3 Accordingly, I request that you furnish me with a copy of Metcon Research's report, its underlying data, and any other leach test reports and data that have been generated from project materials. I also suggest that BLM subject all such reports and data to its own, independent analysis rather than rely on AZCO's

Response to Letter 11

11-1 Reference to the Metcon Research report has been added to the text.

11-2 The discussion under Section 4.3 has been expanded. Also see new Appendix C - Report on Waste Material Testing.

11-3 A copy of the Metcon Research report has been sent to Mineral Policy Center.

Meg Jensen/BLM
March 31. 1992
Page 2

conclusions. If BLM has already done so. please furnish me with copies of any written materials describing such analysis.

Thank you for your assistance.

Sincerely,

David A. Mullon Jr.

cc: Lainie Levick
Phil Hocker

Letter 12

GRAHAM COUNTY BOARD OF SUPERVISORS

GRAHAM COUNTY COURTHOUSE - 800 MAIN STREET - PHONE 428-3250
SAFFORD, ARIZONA 85546

SUPERVISORS
DELBERT HOUSEHOLDER, CHAIRMAN
REX BARNEY, MEMBER
HAYNES MOORE, MEMBER

JOE CARTER, COUNTY MANAGER
BARBARA FELIX, CLERK

April 6, 1992

Larry Thrasher, Project Manager
Safford District Office
Bureau of Land Management
425 E. 4th Street
Safford, Arizona 85546

RE: Sanchez Copper Project

Dear Mr. Thrasher:

The Board of Supervisors are well aware of the proposed development of the Sanchez copper ore body northeast of Safford, Arizona. We have followed this project closely for the past several years. We also received a copy of the Draft Environmental Impact Statement (E.I.S.) dated March, 1992.

12-1 The Board members, by this letter, reaffirm our support for the project and proposed action as identified in the E.I.S. This project, in addition to benefiting the Solomon School District and the county-wide property tax assessed valuation, will also create two hundred plus permanent private sector jobs with an annual payroll of $8 million dollars. By Graham County standards, this project will be significant in terms of a positive impact on property taxation, new payroll dollars generated, indirect employment opportunities, and sales tax revenues.

12-2 Board discussion also focused on the off-site access issues including the proposed route as well as alternatives. More specifically, the County Engineer indicates that the Sanchez Road meets the Rural Collector Road criteria in terms of traffic volume capabilities, as published by the Federal and State government. Basically, the road width, including shoulders, is designed for a traffic volume of up to four hundred vehicles a day. The present average daily traffic count is about one hundred-ten vehicles a day. The Impact Statement indicates an additional one hundred-eighteen vehicles daily, which combined with the present volume is substantially lower than design standard. We recognize the concerns of citizens residing along certain sections of the Sanchez Road and believe that with cooperative effort of the County, the mining company and affected citizens, much of the traffic concerns can be mitigated. The alternative

AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION EMPLOYER

Response to Letter 12

12-1 Thank you for your comment.

12-2 Please refer to General Response No. 1 - Access Route.

Larry Thrasher
April 6, 1992
Page 2

12-2 cont'd. options of the Solomon Pass Road and the new road directly to the mine, in our opinion, would be a major investment and only for the purpose of serving the mine during its life. Our preference is to invest limited resources in mitigation efforts which would provide long term transportation benefits to area residents as well as future access to the Gila Box area.

The County, in discussions with the mining company, believes that realignment of certain sections of the Sanchez Road and improved traffic safety devices would result in the best long term investment of limited resources. This approach is also consistent with our area wide local government transportation study and development plan which has been underway for about a year. The County, over the next sixty days, will work aggressively with affected citizens and the mining company in an effort to develop a consensus for a mitigation plan for Sanchez Road.

Sincerely,

GRAHAM COUNTY BOARD OF SUPERVISORS

Delbert Householder
Delbert Householder, Chairman

Haynes Moore
Haynes Moore, Member

Rex O. Barney
Rex O. Barney, Member

Letter 13

ARIZONA STATE PARKS

800 W. WASHINGTON
SUITE 415
PHOENIX, ARIZONA 85007
TELEPHONE 602-542-4174

April 6, 1992

Ray A. Brady
District Manager
DOI Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, AZ 85546

RE: Sanchez Copper Mine Project, Draft EA, DOI-BLM

Dear Mr. Brady:

Thank you for sending us a copy of the draft Environmental Assessment (EA) for the above project. I have reviewed those portions of the draft EA that apply to cultural resources and have the following comments pursuant to our Programmatic Memorandum of Agreement (PMOA):

13-1 1. The draft EA Indicates that all 36 sites my be eligible for Inclusion in the National Register of Historic Places. It would be more correct to say that the BLM has consulted with the Arizona SHPO and both agree that all 36 sites are National Register eligible.

13-2 2. I note that SWCA Is preparing a treatment plan for this project. Please ensure that that plan Includes a discussion for the potential for the project to impact human remains.

We look forward to continuing our consultations on this project and appreciated your continued good cooperation with our office. If you have any questions, please contact me.

Sincerely,

Robert E. Gasser
Compliance Coordinator

for Shereen Lerner, Ph.D.
State Historic Preservation Officer

CONSERVING AND MANAGING ARIZONA'S HISTORIC PLACES, HISTORIC SITES, AND RECREATIONAL, SCENIC AND NATURAL AREAS

Response to Letter 13

13-1 This section has been corrected in the Final EIS in response to your comment.

13-2 The treatment plan includes a discussion on the potential for the project to impact human remains.

Letter 14

MINUTE RECORD OF THE COMMON COUNCIL OF THE CITY OF SAFFORD AT A MEETING HELD ON THE DAY OF 19
AT THE CITY HALL AT

RESOLUTION NO. 960

A RESOLUTION OF THE MAYOR AND COMMON COUNCIL OF THE CITY OF SAFFORD, GRAHAM COUNTY, ARIZONA IN SUPPORT OF THE SANCHEZ COPPER PROJECT

WHEREAS, the City Council and each individual member is well aware of the proposed development of the Sanchez copper ore body northeast of Safford, Arizona, having followed the project closely for the past several years, and

WHEREAS this Council and its members in the past have been supportive of the project and have recently received a copy of the draft Environmental Impact Statement, dated March 19, 1992, and

14-1 WHEREAS the proposed action as identified in the Environmental Impact Statement will benefit the Solomon School District and the countywide property tax assessed valuation will create jobs in the private sector and thus create new payroll dollars in direct employment opportunities, sales tax revenues, property tax increases and will support local businesses and in general have a positive economic impact upon the area, and

14-2 WHEREAS the Council believes that the project will have no adverse environmental impact, as the project is outlined, utilizing the current Sanchez Road by improving and realigning certain sections and installing traffic safety devises, and appears to be a greater benefit to more people than either of the alternatives which would be roads serving only the mine.

WHEREFORE, the Mayor the Common Council do by this Resolution endorse and support the Sanchez Copper Project as identified in the Environmental Impact Statement, dated March 19, 1992,

PASSED AND ADOPTED this 13th day of April, 1992.

Governor Aker
Governor Aker, Mayor

Van Talley
Van Talley, Vice Mayor

J.T. Cotter
J.T. Cotter, Member

Ed Ragland
Ed Ragland, Member

Response to Letter 14

14-1 Thank you for your comments.

14-2 Please refer to General Response No. 1 - Access Route.

Marge Schade
Marge Schade, Member

Paul Christensen
Paul Christensen, Member

Warren Williams
Warren Williams, Member

ATTEST:

Pat Savage
Pat Savage, City Clerk

APPROVED AS TO FORM:

Irval L. Mortensen
Irval L. Mortensen, City Attorney

Letter 15

R.R. Schmoller, Ph.D.
Ecography
RT 2 DH #16
Safford, AZ 85546

Larry Thrasher
BLM Project Manager,
Safford District BLM
425 East 4th Street
Safford, AZ 85546

April 14, 199

Re: AZCO Mining's Proposed Sanchez Copper Mine

Dear Bureau of Land Management,

This letter is a sketch along the lines I voiced at the recent BLM public meeting in Safford. It may, perhaps, be best regarded as mainly a note to a future, more ecologically sensitive political regime. Whether regarded as a current comment or future alert I do not, at the present time, either condemn or condone the project in any of its optional forms. However, decisions made this year may reduce both potential ecological damage as well as "threats" to mining activities by ourselves in a more ecologically sensitive future. It should be noted here that I do not forsee the end of mining within the next 100 years, but mining or any other action is not above the law of "equal and opposite" reaction of ecological processes.

15-1 The concern we should show regarding the AZCO mining proposal at Sanchez does not involve endangered species but does involve a major possible threat to the inter-connecting isthmus between the subtropical Sonoran and Chihuahuan deserts. The Gila River corridor (and perhaps to a lesser extent its tributary the San Simon "River" corridor) constitutes the only ecological bridge between North America's two main warm deserts.* It is also of some significance that this eco-isthmus is at the northern and altitudinal limits (c. 4000′) of both deserts.

I have not done a thorough analysis of pertinent species maps or studied the Gila ecological isthmus' biota in any detail, but neither has the BLM, which is not to its credit. However, using the Draft EIS (March, 1992) and maps (mainly of cacti, reptiles and amphibians) it is obvious that the proposed Sanchez mine could hardly be located in a position more likely to disrupt the Gila eco-isthmus.

*See maps p. 171 and 189 in Brown, D.E. (editor) 1982 Biotic Communities of the American Southwest - United States and Mexico. The smallish Safford (=Pinaleno) Desert is roughly in the overlap area of the Chihuahuan and Sonoran Desert maps.

Response to Letter 15

15-1 Issue 1.

The project, because of its location near the Gila River, will disrupt the only isthmus of land connecting the Sonoran and Chihuahuan Deserts and disrupt gene flow and other related behavioral-ecologic phenomena of plants and terrestrial animals, such as reptiles, amphibians and mammals.

Response 1.

BLM specialists familiar with the ecological features of these ecotones area have reviewed this issue in the field as well as maps included in Brown & Lowe (1980 Biotic Communities of the Southwest). These maps are a generalized mapping of the plant communities of the Southwestern United States and Northern Mexico, at a scale of 1:1,000,000, illustrating the spatial relationship of the Sonoran desert scrub (map unit 154.12), Chihuahuan desert scrub (map unit 153.2), semidesert grassland (map unit 143.1) and numerous other communities. Based on these reviews we have concluded that there are several areas where the Sonoran and Chihuahuan deserts interface, and the project area is only one of them. The entire San Simon valley is an area where species from both deserts can continue genetic interchange during the brief time period (on geologic and genetic scales) that the Sanchez Project will be ongoing. Any disruption would be of a very local nature and for too brief a time to be important to any species in the region.

We do not understand the statement that the mine will disrupt related behavioral ecologic phenomena of plants and terrestrial wildlife.

Letter 15 continued

15-1 cont'd.

It is well known that gene flow and other, related, behavioral-ecologic phenomena such as species range extension and small population viability or survival can be easily blocked or disrupted at narrow places such as riparian corridors or during logging-related fragmentation of forests. The Sanchez mine would be located at one of the most critical "bottle-necks" within the long, usually much wider, Gila eco-isthmus. The mine would be located where the Gila Mountains (generally 5000′ + to 6600′) make their closest approach to the Gila River, reaching in fact the agriculturally-altered floodplain of the river at the village of Sanchez (elevation c. 3000′), where the village has caused further ecological damage to the gentler slopes adjacent to the floodplain. There is no comparable bottleneck between mountains and floodplain to the west where the river and mountains are usually miles apart, nor to the east in the Gila Box Riparian National Conservation Area (3 miles upstream and beyond).

The Sanchez mine would ultimately put an actual hole nearly a mile in diameter, from one-half to one and one-half miles north of the village of Sanchez. In addition there would be a principal waste dump next to the hole, spanning an upslope area over one and one-half miles long (and over one-half mile wide) from near the floodplain (c. 3100′) to about 3,800′ elevation. Heap leach pads of up to the same order of size are among other obstacles planned for the eco-isthmus at perhaps its most vulnerable place.

15-2

Re-vegetation and related reclamation procedures are ultimately planned for the mine when it is de-commissioned after 17 years of operation but no restoration, no matter how expensive (unless perchance it cost more than the mine profited, but even then the energy, etc employed would have quite a negative planetary eco-impact) could restore the desert to its original, natural character. In effect there would be selection for biota able to live in an unnatural (damaged) state, much as certain plants on European mine spoils have evolved to live in the unnatural landscape while their ancestral forms can't. This would be "genetic engineering' without concern for ecologic heritage or ecologic context. The Gila eco-isthmus would remain damaged, broken in some respects.*

*It should be noted here that Table 2-4 "Plant Species Potentially Used for Revegetation" may indicate the use of geographic-genetically alien seed sources of Sanchez area resident species which would only compound the genetic-ecologic damage to the Gila eco-isthmus. Also, even worse, species such as Bur Sage and Foothills Paloverde are not Sanchez area residents and should under no circumstances be introduced.

Response to Letter 15

15-2 Issue 2.

The proposed revegetation plan will not restore disturbed areas to the original, natural character.

Response 2.

The project will reclaim 765 acres of the 1,400 acres of impact. A test plot research program will be implemented to determine those Arizona native plants most capable of inhabiting the disturbed areas. Selection of the best plant species for revegetation combined with plans to salvage and redistribute cover soil with subsequent irrigation for one to two years assures that revegetation has an excellent chance of establishing a native self-sustaining ecosystem. This restored ecosystem will provide habitat for wildlife and will eventually serve as a corridor for species movement and gene flow to the isolated Chihuahuan desert scrub community up the Gila River Valley.

15-2 cont'd.

Of course pollinating insects, bats, etc. might be able to help "jump" the gap across the Sanchez area degradation, but reptile, wildflower, etc re-colonization may be semi-permanently (>1000 years) blocked by "scrambled" mineral and soil features. As the Draft EIS points out (page 4-18) 900 acres of natural vegetation would be permanently lost and over 500 additional acres merely "salvaged". Hundreds of acres have already been damaged by previous mining operations and by Sanchez residential occupancy, not to mention the near total alteration of the Gila River floodplain. Most of the proposed new damages would be on the "upland" environment (p 3-36), which along with smaller areas of the to-be-damaged desert wash environment would bear the brunt of the open pit and waste dump activities. The upland and desert wash (p 3-35) environments contain the most Sonoran biotic elements (e.g. Blue Paloverde and Brittlebush) being microclimatically warmer and drier, while the flat "terrace environment" (p 3-35) is dominated by the Chihuahuan biotic element's 13 chromosome Creosote Bush as well as by one of the Pinaleno pocket-desert's few endemic ("peculiar", restricted) species, the Devil cholla, Opuntia stanyli var. stanyii .

It seems appropriate, at this juncture, to make some ecographic notes on some of the biota which I have (rather casually) observed to grace the Gila eco-isthmus or otherwise define it. The Sonoran desert biota includes Saguaro cacti, Yellow (or Foothill) Paloverde, Triangle and White Bur Sage, all of which reach their eastern limits a few miles west of Sanchez. Jojoba, perhaps just above the proposed mine, reaches east to near Sanchez. Blue Paloverde and Brittlebush mostly constrict their distributions near Sanchez (due to the Gila Mountains' higher, unsuitable environments) but also occur in tiny, scattered numbers south of the Gila River and east to near the New Mexico line. Many other Sonoran species show similar patterns (e.g. Gila Monster, Night-Blooming Cereus cactus, velvet Mesquite, and California Leaf-Nosed Bats).

Chihuahuan desert biota include Fendler's hedgehog in the uplands, the 13-chromosome Chihuahuan version of the Creosote bush in most habitats, the Chihuahuan side-blotched lizard (Uta stansburiana stegnegeri), the Plains Spadefoot toad, and (most probably) the Texas horned lizard and Round-tailed horned lizard, among others.

The Pinaleno "pocket" desert (formed largely by the rain shadow of Mt. Graham, the Pinaleno Mountains) includes the driest terrains in a hundred mile radius. Pinaleno desert endemics are few, perhaps because the desert "disappears" after 10,000 year intervals during the moister glacial times. The devil cholla (noted above) is one of the rare Pinaleno desert endemics. Certain reptiles such as the Common Collared Lizard and Common Kingsnake are know to form subspecies-intergrades in southeast Arizona between Sonoran, Chihuahuan, northern, and southern subspecies, giving a hint of some of the genetic-ecologic beauty and complexity of the Pinaleno desert area as well as the Gila eco-isthmus.

Issue 3.

The reclamation effort can't recreate the original, natural character of the desert. Revegetation will fail and create an unnatural (damaged) state and result in "genetic engineering" without concern for ecologic heritage and create a negative planetary eco-impact. There will be a selection of biota able to live in unnatural landscapes such as certain plants on spoil in European mines.

Response 3.

The above statement has no factual basis. The example of plants colonizing and adapting to mine spoil in Europe is actually a remarkable illustration of the genetic variability of the gene pool of colonizing plants. Every effort will be made to utilize seeds of local plants in the original planting trials. We will select individuals best adapted to the precise soil conditions in the reclaimed areas. Within reasonable time frames, we believe, differences between the original character of the desert and the reclaimed sites will be insignificant.

Issue 4.

Bursage and foothills paloverde are not Sanchez area residents and should, under no circumstances, be used in the reclamation program.

Response 4.

You are correct in that these species are not Sanchez area natives. We will substitute C. floridum and other local species in our research seed mix. Every effort will be made to utilize seeds of local plants in the original plantings and we will select individuals that grow best in the soil in reclaimed areas. See revised Table 2-4 in the Final EIS.

As noted above, many biotic elements reach their northern limits in the Gila eco-isthmus (e.g. the Phainopepla's winter range, the White-winged Dove's* summer limits). The Draft EIS notes the Banana Yucca as occurring near or in the proposed Sanchez site, a species which extends north to southeast Colorado, and reaches its southerm·limits in or near the Gila Mountains in Arizona. There are probably many "northern" midlatitude species which reach their southern limits in the Gila Mountains.

The Gila eco-isthmus seems to be the only ecological corridor connecting the two great subtropical deserts of the body of North America. This eco-isthmus also serves therefore as a ecological "buffer" between midlatitude and subtropical ecoregions and as a principle aspect of the unique Pinaleno pocket desert.** As in any case involving the freedom to chose, whether the decision would result in action leading to the splitting of an atom or the transport of alien materials to another planet, whatever the scale or scope of the action under consideration, we should ask: Will my decision help restore our battered planet (or Solar System) a little back towards its natural, healthy state before humans made their first wrong turn (c. 50,000 B.C.?) or does my decision merely add to the negative input, increase the damages? In many cases such as the Sanchez mine, in all probability, the choice will not be, regretfully, between good and evil, but between the lesser of two evils. No matter what the political situation is in, say, A.D. 2000 we humans will need to maintain and improve our technologic infrastructure if only to be able to dismantle it in an orderly way and invest in "low-tech", basic/healthy living. We can't live a healthy life without copper today, though not all copper is extracted with the same degree of "collateral" eco-damage. We also, obviously, can't live as well with a more damaged versus a less damaged planet. In the case of the Sanchez mine an inadequate assessment of the proposed mines' debits and credits has been made. The predictable results of poor planning is, as they say, "piss-poor" performance. Everyone who is involved with the Sanchez mine is responsible for this present state of affairs and the unforseen, not-thought-of,

*Two subspecies of white-winged Dove meet along a north-south zone near Sanchez and south: A Sonoran and a Madrean subspecies.

**In healthy nature all features, including ecological isthmuses, are born, grown, and die, usually to be "reborn" in a somewhat different growth form. The Gila eco-isthmus is an especially "fine" area of such natural, healthy changes, and as such is naturally quite sensitive to minor natural (and unnatural) climatic shifts, overgrazing, mining and other effects of healthy and cancerous phenomena.

and therefore unprepared-for future results. God is forgiving. Can we forgive ourselves and get with His program? (". . . not life, but a good life, is to be chiefly valued. . ." Socrates in Crito. "And God saw every thing that he had made, and, behold, it was very good." Genesis 1:31. Also, as a little girl once said: "God don't make junk".

As a final note I will make one "nuts-and-bolts" suggestion if the mine is to be generally approved. Damage to the Gila eco-isthmus can be minimized if the pattern of damage is kept "spotty", or at the very most like the black squares on a checker board—if, for example, there were undamaged areas left all around the open pit, and if the waste dumps were not immediately adjacent to the pit except, perhaps, at one small place ("point"). Also, the main waste dump's great extent (in conjunction with its abutment along the entire east side of the open pit) is the main currently planned obstruction in the Gila eco-isthmus. Could the waste dump be fragmented into smaller pieces? As it is now (Figure 2-2, General Site Plan) the main and secondary waste dumps abutting the open pit between them produce a combined obstacle about two miles long in north-south extent, ranging from over one-half to one and one-half miles wide. (The initial and future heap leach pad configurations are much less destructive as blockades though they do seem to"edge" the critical upland-terrace ecotone.)

Thank you for your attention. I do hope that AZCO's proposed mine impacts can be minimized and some ecologic health maintained; and that, if so, the copper can be used to good purpose. However, it is also possible that AZCO would inflict significant and unnecessary ecological damage to the Gila eco-isthmus and therefore to both the Sonoran and Chihuahuan deserts and their position and function within the body of North America. If such genetic-ecologic damage is even a possible outcome, given our current state of ecographic ignorance and doubt, then AZCO's Sanchez project should be stopped sooner rather than later. Due to ignorance and uncertainty I myself can neither condemn nor condone AZCO's current plan. In such an ignorant state it would be best to wait for knowledge and wisdom to help us make a reasonable decision.

-6-

I hope I have helped raise some of the right major questions. I believe that ecology is a synonym for love as Jesus defined the great commandment: To fully love God and your neighbor (Matthew 22: 36-40). Since God "don't make junk" but rather everything which He made "was very good" it is obvious that Texas horned lizards, paloverdes, rocks, mountains, deserts, and eco-isthmuses are all our neighbors, and we are their neighbors. All of healthy nature is a united state of united states of being.

Sincerely,

R.R. Schmoller

428-7000 or 428-5885

cc: Grand Canyon Chapter, Sierra Club
Huachuca Audubon Society
San Carlos Apache Reservation Tribal Council

Letter 16

GRAHAM COUNTY BOARD OF SUPERVISORS

GRAHAM COUNTY COURTHOUSE · 800 MAIN STREET · PHONE 428-3250
SAFFORD, ARIZONA 85546

SUPERVISORS
DELBERT HOUSEHOLDER, CHAIRMAN
REX BARNEY, MEMBER
HAYNES MOORE, MEMBER

JOE CARTER, COUNTY MANAGER
BARBARA FELIX, CLERK

April 17, 1992

RE: Sanchez Mine Project

Dear Citizen:

16-1 The Board of Supervisors, during their meeting on Monday, April 6, 1992, acknowledged receipt of the Sanchez Road petition. They also toured the alternate access routes as identified in the Draft Environmental Impact Statement. Based on discussion with Staff, the Board of Supervisors has scheduled a work session for Monday, April 27, 1992 at 7:00 P.M. The work session will be held in the E.O.C. Meeting Room located in the basement of the Graham County Courthouse and you are urged to attend.

Sincerely,

Joe Carter

Joe Carter, Manager
Graham County

AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION

Response to Letter 16

16-1 Please refer to General Response No. 1 - Access Route.

MINERAL POLICY CENTER

• P. O. BOX 2998 • DURANGO, COLORADO • 81302 • 303-385-6751 •

April 16, 1992

Meg Jensen, Area Manager
Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, Arizona 85546

Dear Meg:

Please refer to my letter to you dated March 31, 1992, requesting documents relating to the Sanchez Copper Project. To date, I have received no reply to that letter. Because the requested materials will require careful analysis, please do not wait until the last week to respond to my request. (Since the time of my last letter, AZCO has furnished me with a copy of a Metcon's 4-page report dated October 4, 1989, so there is no need to send me a copy of that report. However, I again request that you send me all of the other materials described in my letter of March 31.)

17-1 At your earliest convenience, please inform me of what, if any, independent analysis BLM will conduct to assess ground- and surface water impacts. The Draft EIS appears to rely entirely on the rather brief Metcon report for its conclusions that the project presents little or no danger of acidification and metal leaching.

17-2 Are you comfortable with these conclusions? A project that will disturb surface and subsurface soil and rock on 1000 acres of federal land should not depend on tests performed on no more than 60 pounds of sample material. This is especially true in view of the Draft EIS's admission that its conclusion about how a thick clay aquitard will protect groundwater resources is based on data from drill sites several miles away from the project.

17-3 From the Draft EIS I infer that AZCO intends to concentrate its analysis of hydrological impacts in the aquifer protection permitting process, not in the EIS. This would constitute a circumvention of NEPA-required impact analysis by deferring analysis to some future, post-EIS date, and by removing it from the public scrutiny of this forum and transferring it to Arizona DEQ. The potential hydrological impacts presented by this project are well known to BLM. NEPA does not say, "Analyze foreseeable environmental impacts in the EIS unless a state agency will addressing the same issues at some future date." It requires such analysis in the EIS.

Sincerely,

David A. Mullon Jr.

17-1 TRC, an independent consulting firm, performed the analysis. BLM hydrologists reviewed their analysis. Based on this review we requested additional data and analysis from AZCO addressing ground and surface water hydrology at the site. This information is presented in revised Sections 3.3 and 4.3 of the Final EIS. The Arizona Department of Environmental Quality, in the Aquifer Protection Permit process, has the responsibility of preventing the project from adversely affecting ground or surface water resources.

17-2 BLM requested that additional information be developed. This information was obtained by Mining & Environmental Consultants and is presented in Appendix C - Report on Waste Material Testing. The new Figure 3-3 presents new, site-specific, drill-hole data obtained in the pad area. Please also refer to revised Sections 3.2.1, 3.3, and 4.3.

17-3 Sections 2.1.6, 2.1.6.1, 2.1.6.2, and 3.3 have been expanded to include data and designs which are the same as required in the Aquifer Protection Permit application. Revised Section 4.3 addresses impacts. A new Appendix D defines the monitoring program presented in the Aquifer Protection Permit application.

Letter 18

7671 E. Tanque Verde #547
Tucson, Arizona 85715
April 20, 1992

Meg Jensen
Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, Arizona 85546

Dear Ms. Jensen:

18-1 Concerning the proposed AZCO copper mine near Safford, I am concerned with several problems involved with this. First, I question if the project will comply with water quality protection regulations, and if this will impact Safford's domestic/agricultural water use.

18-2 Secondly, I wonder how the mining project might affect threatened and endangered species of animals both directly and indirectly.

18-3 Lastly, how much money will be allocated in advance for reclaiming the disturbed land, i.e. waste dumps, heap leach pads and tailing ponds. Is it possible that tax-payers and the environment both will bear the burden of private concerns stripping of the land? I speculate if the land can be reclaimed even if the funds were available.

Please consider these ideas of concern.

Sincerely,

Anne Westenhaver

Anne Westenhaver

Response to Letter 18

18-1 The project must and will comply with the Arizona DEQ laws and regulations, or an Aquifer Protection Permit will not be issued. Safford obtains domestic water upstream of the project and pipes it past the project. Arizona Department of Water Resources has stated that the Gila River Basin is open for groundwater appropriations, and that sufficient quantities of groundwater are available for this project and for continued agricultural use.

18-2 Please refer to Sections 3.6 and 4.6.

18-3 AZCO must post a reclamation bond, payable to BLM, to cover 100% of the estimated costs for reclamation. Please refer to General Response No. 3 - Reclamation Bonding, as well as Appendices A and B (long-term and short-term bond estimates). In addition, Arizona DEQ will require a bond to cover 100% of the cost of clean-up of the processing facilities.

Letter 19

KEITH KELLY
Director

DAN F. RICE
Associate Director

Arizona Department of Agriculture

1688 West Adams, Phoenix, Arizona 85007
(602) 542-4373 FAX (602) 542-5420
PLANT SERVICES DIVISION

April 9, 1992

Bureau of Land Management
Arizona State Office
3707 N. 7th Street
Phoenix, AZ 85014

Attention: EIS Section

Dear Sir:

The Arizona Department of Agriculture has received the proposed Sanchez Copper Project in Graham County. Our permit review committee offers the following:

19-1 ARS 3-908.A states that it is unlawful to destroy protected native plants on state or public lands without obtaining prior permission.

19-2 Under a Memorandum of Understanding with the Department of Agriculture (PDO-82-36), the BLM has agreed to assist the ADA in these salvage operations. ADA will facilitate salvage operations by issuing permits for plant removal. We ask that you keep us apprised of the developments on this project.

Thank you for the opportunity to review this proposal and provide our comments. If you have any questions, please contact Larry Stanford at the letterhead address or call 542-0993.

Sincerely,

Dan Rice
Associate Director
Plant Services Division

DR:LS:mb

Response to Letter 19

19-1 Please see Section 3.5.3 and Section 4.5.4 of the Final EIS.

19-2 BLM will contact ADA and coordinate the inventory and salvage of protected plants before surface disturbance activities commence.

Graham County
CHAMBER OF COMMERCE

1111 Thatcher Boulevard • Safford, Arizona 85546 • Phone (602) 428-2511

April 21, 1992

Larry Thrasher
BLM Project Manager
Safford District Office
425 E 4th Street
Safford, Arizona 85546

Dear Mr. Thrasher,

20-1 Thank you for allowing participation and comments on AZCO Mine's proposal for the Sanchez Copper Mine.

The Chamber of Commerce has been working with the AZCO people for a number of years. We are impressed with the opportunity for employment that the mine will provide and its economic impact on the area. The "socioeconomic impact" estimates 210 jobs created with an annual $8.1 million payroll. The mine would generate an additional $6.5 million increase to local businesses. These numbers are impressive.

The Chamber has also reviewed the "environmental impact". There were no major concerns and we are confident that the local issues raised can be resolved locally.

We support the proposed plan of operation as described in the Environmental Impact Statement. We support the reclamation and closure plan as identified in paragraph 2.1.9

We urge your continued support in working toward a timely decision on the Sanchez project

Respectfully,

Jack Hyde

Jack Hyde,
President

"THE GRAND COMBINATION"

20-1 Thank you for your comments.

Letter 21

Edna Zeavin, Freelance Writer

7901 E. Mabel Tucson, AZ 85715 Tel. (602) 298-1368

May 2, 1992

Meg Jensen, Bureau of Land Management
Safford District Office
425 E. 4th St.
Safford, AZ 85546

Dear Ms. Jensen;

I have a few comments to make on the AZCO Copper Project, mainly about water safety, reclamation of land and impact on wildlife.

21-1 The areas of concern are about the impact on water safety, since Bonita Creek supplies most of Safford's drinking water.

22-1 Will the water fully comply with the water quality protection regulations? Will threatened, endangered or indicator species of animals be threatened by this project? And lastly, will the severely disturbed land (waste dumps, ponds and leach pads) be able to be reclaimed?

I'm sure you are aware of all these problems with the propsed copper mine about to be started.

Thank you.

Sincerely,

Edna Zeavin

Response to Letter 21

21-1 Bonita Creek is upstream from the project, and Safford pipes its water past the project site.

21-2 The project must comply with Arizona DEQ water quality protection regulations. Please refer to Sections 3.6 and 4.6 for discussions regarding Threatened and Endangered Species. The waste dump, ponds and leach pads can be reclaimed, as outlined in the reclamation plan, Section 2.1.9. A reclamation bond will be posted by AZCO, which will cover 100% of the estimated reclamation costs.

Letter 22

2857 W. Calle Carapan
Tucson, Az., 85745
May 2, 1992

Dear Ms. Jensen -

22-2 I am apalled that there seems to be even a chance that the AZCO Mining Company will be able to use Arizona public land for a heap leaching operation. The history of this type operation restoring the land after massive disruption is dismal.

Elna Otter.

Response to Letter 22

22-1 Please refer to General Response No. 4 - Public Lands. The public lands in question are designated for multiple use, including mineral extraction. Without knowing which mines you refer to, it is difficult to assess the reclamation issue you raise. Many existing mine sites are located on private land, outside of BLM jurisdiction. Many mines in the Tucson area are over 100 years old. BLM's reclamation requirements were not instituted until 1981, when the reclamation regulations were implemented. New operations must comply with all local, state and federal laws and regulations, which protect air, water, vegetation, wildlife, and cultural resources. Reclamation bonding is also required, as discussed in General Response No. 3 - Reclamation Bonding.

Letter 23

SIERRA CLUB

Grand Canyon Chapter · Arizona

May 4, 1992

Meg Jensen
Gila Area Manager
BLM Safford District Office
425 East Fourth Street
Safford, Arizona 85546

Re: AZCO Mining, Inc.
Sanchez Copper Project
Draft Environmental Impact Statement

Dear Ms. Jensen;

23-1 The Sierra Club has many concerns regarding this project and the DEIS. While we realize that under the Mining Law of 1872, it is difficult for the BLM to deny a mining permit, you do have the authority and the responsibility to ensure that any mining projects on BLM lands are carried out in the most environmentally responsible manner possible. AZCO Mining has done a fairly good job of analyzing the site conditions and potential problems associated with this project, however, there are many deficiencies in crucial data (concerning groundwater or water quality, for example). Without complete data for analyses of the current conditions of the area it is impossible to accurately predict the impacts of this mine, and many of the conclusions reached in the DEIS can only be guesses.

We are also concerned that none of the environmental consultants working on this project are from, live in, or studied in the Southwest. This is especially important for appropriate analysis of the long-term impacts to the area, and proper reclamation techniques. Local consultants with expertise in the special conditions and requirements of this desert environment should be hired for the development and implementation of the reclamation plan.

23-2 Comments on specific areas in the DEIS are as follows:
Reclamation/Mitigation: The reclamation plan is skimpy and inadequate. The side slopes of the waste rock dump and heap leach pads can and must be contoured, covered with topsoil and revegetated. This has been done successfully at other mine sites and is necessary if the slopes are expected to ever revegetate and support wildlife. Anyone who has seen old tailings piles that have been left to "naturally stabilize" (p. 2-34) in arid climates knows the result: these slopes are unstable and over time will erode to create badlands-like formations. Very little, if any, natural revegetation occurs, and they "appear prominent" for many, many, years. This simply is not an acceptable method of reclamation. The added cost of revegetating these slopes should not be enough to make or break this project, and some attempt should be made to reclaim them. This process should also be on-going, especially for the waste dump which could be revegetated as each section is

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Response to Letter 23

23-1 Please refer to General Response No. 2 - Hydrology. BLM has requested additional data and analysis of ground and surface water issues in response to issues raised in comment letters. This data and analysis are presented in Sections 3.3 and 4.3 of the Final EIS.

23-2 Alternative reclamation techniques were considered, as discussed in Section 2.2.5. However, the limited availability of cover soil restricts the amount of reclamation which can be successfully performed on the side slopes. As discussed in General Response No. 5 - Reclamation and Post-Closure Management Committee, After operations commence, and at least five years before operations cease, BLM will organize a team of AZCO officials, environmental specialists, local government representatives and interested citizens to review the reclamation needs of the project site. They will evaluate results of salvaging efforts, tests plots, and concurrent reclamation, and analyze new technological advances in reclamation to determine the best methods to achieve the reclamation goals for the site.

Only native plant species will be used in revegetation, as listed in Table 2-4.

23-2 cont'd

completed. This is a technique that has been used elsewhere with great success. It can be a cost saving method since it requires less stockpiling of topsoil and spreads out the cost of reclamation over the life of the project when cash flow is best. This idea was mentioned briefly (p. 2-35) but was not developed anywhere. It should be seriously considered.

It seems that only a small portion of the disturbed area is to be revegetated: 507 out of 1407 acres. Excluding the 310 acres for the open-pit, this leaves 590 acres unreclaimed. If this figure represents just the slopes of the leach pads and waste dump, it is an unacceptable amount of land left uninhabitable for wildlife.

Only local, native plant species must be used to revegetate.

23-3

The top of the open-pit should be contoured and seeded, not just left as is. Partial back-filling should be looked at as an alternative. This would decrease the final depth of the pit and also reduce the amount of rock in the waste dump.

23-4

No mitigation for the open-pit was indicated. Why is this acceptable? Some sort of mitigation should be required. Why not have AZCO contribute to the long term protection of a nearby threatened area in exchange for destroying this huge site. For example, The Gila Box Riparian National Conservation Area is threatened by many mining claims. To improve their public image, AZCO could purchase some of those claims in critical riparian areas and then release them so no mining would ever occur there.

23-5

The plan to direct drainage across the top of the waste dump to the west hillside would seem to have the effect of forcing the water flow through the dump. This attempt to avoid excessive erosion of the side slopes may have the side-effect of increasing the amount of leaching through the dump. If the slopes were stabilized with plant cover, erosion would not be a problem, and this potential leaching could be avoided.

23-6

Diversion ditches which are required to direct water runoff away from the project area and are to remain after mine closure were not addressed (p. 2-34). No plan was included to stabilize these ditches to keep future water from flowing across the project site. Will AZCO continue to monitor these ditches forever, or is there a long-term water diversion plan?

23-7

A long-term monitoring plan for the reclamation work was not included. This is an important part of any reclamation plan and should be submitted for approval prior to approval of the mine plan. The time-frame and criteria for reclamation release (p. 2-38) should be more detailed.

23-8

Hydrology: Much of the discussion regarding groundwater assumes that the pit will only intersect the upper aquifer, and that the upper and lower aquifer are separate. It appears that the amount of core drilling in the pit area was fairly minimal and not sufficient enough to come to the above assumptions or conclusions. The relative locations of the two aquifers must be verified since there could be disastrous effects if they are in fact found to be connected somewhere. This is an especially serious problem since no method of pit de-watering after mine closure was mentioned in

2

23-3 Please refer to the new alternative for partial backfilling of the pit in Section 2.2.6.

23-4 Please refer to General Response No. 6 - Mining Claims. BLM will identify any/all required additional conditions and/or stipulations in the Record of Decision.

23-5 Please see Appendix C - Report on Waste Material Testing, which concludes that leachate from the waste rock will be well within State of Arizona Water Quality Standards.

23-6 Please see Section 2.1.9.5. (Sediment Control).

23-7 Once reclamation of the site is deemed acceptable, the reclamation bond will be released. See General Response No. 5 - Reclamation and Post-Closure Committee. A team of will review reclamation techniques, evaluate success and develop a long-term strategy for site management.

23-8 Please refer to General Response No. 2 - Hydrology.

the DEIS.

23-9 Most of the water quality data from the wells (Table 3-5) is 30-50 years old, and is used to conclude that the lower aquifer is of too poor a quality to be used for irrigation purposes and can therefore be contaminated by this project. Presumably this is also the data that will be used to assess the on-going impacts to the local water quality (they admit that no water quality data in the project site and open-pit is currently available). The DEIS states that no pump test data is available for the stream channel alluvium aquifer or any perched water bodies in the terrace alluvium at the pit area and that limited data on the hydrological characteristics "near the project site" can be used. It also states that the hydrological characteristics of Bonita Creek (several miles away) can be used to "approximate" the conditions in the project area. It then states that hydrologic conductivity "tends to vary widely". How can hydrological data from miles away be used to accurately assess the conditions at the site if those conditions vary widely? The old data is obviously not acceptable and should be updated to reflect current conditions at the mine site. Additional, detailed, site specific studies must be conducted. Potential groundwater problems are too serious to use such random and incomplete data.

23-10 Much of the hydrologic analyses is being left for the Aquifer Protection Permit process, and is therefore not being fully addressed by the DEIS. The intention of the NEPA process is to provide exactly this type of information to the public for review and comment. We request that the hydrological data be completed and provided to us (and others) for review before the DEIS is approved. The potential impacts to the area hydrology from this project cannot be taken lightly - it is probably the most serious and crucial issue here.

23-11 The problem of pit de-watering after mine closure was not resolved in the DEIS. It is mentioned often that the pit will intercept the lower aquifer and a series of wells will be installed to intercept the expected 200-500 gpm flow into the pit during mining. It appears that AZCO plans to abandon these wells when the project is through and allow the pit to fill with water. The problems that will result are well known: the waters from the aquifer will mix wi water in the pit which will contain runoff from the site and the pit sides, resulting in a toxic soup that will continually contaminate the aquifer and remain forever as an eyesore and hazard to humans and wildlife. We are not convinced from the data presented that this lower aquifer is in fact completely separate from the upper aquifer (used by nearby residents for domestic and irrigation purposes), or that this is the only available solution to this problem. We strongly recommend that an acceptable post-closure de-watering plan be required from AZCO that will positively protect both aquifers.

After reviewing the hydrological data and analyses, one is not left feeling very confident that AZCO really understands the hydrological conditions at this site, and even worse, knows what they'll do if things aren't exactly as they've assumed. The heavy reliance on assumptions and general vagueness of the site hydrology is disconcerting, to say the least. More study is obviously needed

23-9 Table 3-5, Summary of Water Quality Data from Selected Wells, is used to present an historical overview. Please refer to the new hydrology information presented in Tables 3-7, 3-8, 3-9, and Section 3.3 of the Final EIS. Since Bonita Creek will not be affected by the project all data relevant to this body of water has been removed from the Final EIS.

23-10 Sections 2.1.6, 2.1.6.1, 2.1.6.2, and 3.3 have been expanded to include data and designs which are the same as required in the Aquifer Protection Permit application. A new Appendix D defines the monitoring program presented in the Aquifer Protection Permit application.

23-11 Please refer to General Response No. 2 - Hydrology.

Letter 23 continued

before anything definite can be concluded regarding the hydrological impacts from the mine.

23-12 Solution Ponds: The design of the solution ponds and ditches are based on 100 year, 24 hour rainfall. This figure is an assumption based on observances of high rainfalls over recent years during which records were kept. Little real weather data exists from 100 years ago for this area, and as a result no one really knows what a 100 year, 24 hour rainfall would be like. Many structures built based on the "100 year flood" criteria were destroyed in the October 1983 floods in Southern Arizona. It is clear that structures intended to contain toxic solutions should be designed with a more generous safety factor. The safety factors used in this project do not seem adequate.

23-13 The DEIS does not specifically call for netting of the ponds to keep waterfowl out (p. 2-23). All ponds should be netted, in addition to being fenced, from the beginning of the project, or else a threshold for mortalities should be set after which the nets are placed (ie: after one death, the nets go up within 24 hours).

General:

23-14 According to the DEIS, a clay liner will be the only liner used under the heap leach pads. Is this in compliance with the BADCT guidelines under the Aquifer Protection Permit? Has there been sufficient study of the leach pad sites to properly analyze the conditions there? A single clay liner will most likely leak eventually. We strongly recommend a double liner be utilized which includes one layer of at least 60-mil HDPE.

23-15 The Aquifer Protection Permit has not been approved yet to our knowledge. Would BLM approval of this project as presented so far be considered unnecessary and undue degradation of the public lands if ADEQ later finds deficiencies in the AZCO proposal? We recommend no approval or conditional approval be granted until the APP is approved by ADEQ.

23-16 The Biological studies found no evidence of Gila Monsters on the site even though they are known to be in the area. This is not surprising since the studies were conducted during a time of year when the reptiles are not active. Will additional surveys be conducted this summer (during the monsoons preferably) to look for gila monsters? We highly recommend it.

23-17 The DEIS mentioned that the method of dealing with the bats occupying the old adits on the site would be to "flush" them out. We certainly hope a more sensitive method is used especially since this is a maternal colony. Perhaps AZCO could wait for most of them to leave during the evening feeding flight, flush out any remaining bats, and then seal the adit when they're certain no bats are left inside.

23-18 The DEIS did not mention a monitoring plan for the project site and surrounding areas either during the operation or after closure. A monitoring plan needs to be developed in order to detect any changes or declines in water quality and wildlife habitat in the vicinity of the mine and downstream. On-going monitoring is necessary so that in the event of any negative impacts, remediation measures can be begun at once before the

4

Response to Letter 23

23-12 Please refer to revised Section 2.1.6.2. The design standard required by agency regulations is the 100-year, 24-hour storm event.

23-13 Please refer to General Response No. 7 - Netting.

23-14 Site conditions have been evaluated, and the clay liner meets the BADCT requirements of the Arizona DEQ Aquifer Protection Permit program.

23-15 BLM approval of the project will be conditional upon compliance with all applicable local, state and federal regulations. AZCO cannot proceed with the project until all State of Arizona permitting requirements are met.

23-16 Biological studies were performed in December 1989, May-June 1990, and October 1991.

23-17 Bat experts in consultation with United States Fish and Wildlife Service and Arizona Game and Fish Department used flushing techniques at the appropriate time, and the adits were sealed.

23-18 Please refer to Appendix D - Monitoring Plan in the Final EIS.

problem is irreversible. Monitoring should continue after closure. Groundwater can move very slowly and contamination may not show up for years. AZCO should be required to clean up any future toxicity problems resulting from the mine.

<u>Alternates</u>: The alternates did not seem to cover any "real" alternatives such as reducing the scale of the project and pit, or a more thorough analysis of the no action alternative. Although the Mining Law does allow mining of the public lands, this does not necessarily mean that mining must be allowed. The BLM does have the authority to deny a permit based on unnecessary and undue degradation of the public lands and this has been done (Old Yuma Mine near Tucson, 1992). The no action alternative should be looked at in terms of value to the community (short-term economic benefits from the mine vs. long-term impacts to the landscape and environmental quality). Since this is such a large project, a smaller scaled project should be considered.

23-19 Finally, we would like to add that while the DEIS analyzed the impacts from the proposed mine, it is not sufficient to just raise the issues - the problems must also be resolved. We are greatly disappointed that so few real solutions were offered to the problems identified. It is obvious that once again we are faced with the question "Are the long term losses to the environment worth the short term gains from this project?". The long-term, permanent, irretrievable and irreversible losses are numerous and real. If this project proceeds we will always have a huge open-pit scarring the landscape and probably causing contamination to the aquifer. We will always have bare rock slopes around the leach pads and dumps that will probably never support any kind of vegetation or wildlife. We will probably always have a problem of acid mine drainage from the leach pads and waste dump. And the gains will be a boom economy for Safford for the short 20 years life of the mine (and then bust after AZCO leaves). Our society will gain from all the copper retrieved from this deposit, and will be able to continue in our quest for endless (and unsustainable) growth and development. And AZCO will make alot of money. These benefits somehow don't quite seem like enough to justify the permanent destruction of such a large area. We would rather see AZCO invest their $75 million in a copper recycling facility - which would be a real benefit to society.

Thank you for the opportunity to comment on the Draft Environmental Impact Statement. Please keep us informed of the progress of this project.

Sincerely,
Lainie Levick

Lainie Levick
Sierra Club
P.O. Box 30142
Tucson, Arizona 85751

cc: Craig O'Hare, Chapter Conservation Chair

23-19 Please refer to General Comment No. 4 - Public Lands and to General Comment No. 6 - Mining Claims.

Letter 24

May 2, 1992

Larry Thrasher
Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, AZ 85546

Dear Mr. Thrasher,

I have examined the DEIS for the Sanchez Copper Project and have the following comments to make for your consideration:

24-1 1. Assessment of backfilling as an alternative reclamation procedure is inadequate. Dismissal of this alternative is based on inability to "fit" all the final waste material back in the hole because of the bulking factor, cost, need to relaim the "footprint" of waste stockpiles, lengthened project life with associated impacts, and the "need" to retain a stable highwall to preserve evidence of mineralization.

Potential benefits of backfilling are not mentioned at all. These would include return of a much larger proportion of the land to a usable state, elimination of a permanent hazard, restoration of surface and groundwater links, elimination of open toxic water bodies, major reduction of scenic impairment, and lengthened job opportunities.

Partial backfilling to eliminate some of these problems (for example, open toxic water bodies, elimination of the small western waste dump) should also be considered if complete backfilling is rejected. Economic feasibility was not assessed at all, although partial backfilling was determined to be feasible in the case of the Jackpile-Paguate uranium mine in New Mexico (BLM/BIA FEIS, 1985). A complete cost-assessment should be made for partial and complete backfilling.

2. Reclamation goals and bond-release requirements need to be substantially strengthened:

24-2 A. The goal of creating erosionally stable landforms for leach pads, waste dumps is not compatible with restriction of resoiling and revegetation of top surfaces only; apparently no long-term stabilization of pit walls is contemplated.

24-3 B. Reclamation does not address the issue of effects of the pit on groundwater.

24-4 C. The plan to strip soil from otherwise undisturbed areas surrounding the leach pads for additional soilcover for pad sideslopes appears to be a questionable practice without assessment of the thickness and horizon characteristics of the soil.

24-5 3. Revegetation plans, including test plot research and post-mining reclamation, are not adequately specified, and no monitoring plan is presented. Sequential reclamation of waste dumps and leach pads appears feasible during operations. Real effort to reclaim these areas would give valuable guidelines for assessing successful techniques as well as bond-release criteria. It is essential to spell out in detail the standards of revegetation to be sought (species diversity, density, cover); a viable plan for salvaging vegetation capable of transplantation in the areas to be disturbed is needed, and a nursery or nurseries established to accomodate the salvaged plants and to conduct other revegetation research; an excellent approach was developed for the Castle Mountain project in California (BLM/County of San Bernardino, 1990 FEIS/EIR) that should be used as a model. Assurance of serious attention to reclamation needs can be strengthened by establishment of an independent review panel of experts, including biologists, soil scientists, hydrologists/geologists, and ecologists, as done for the Castle Mountain project. This appears to be a highly successful and mutually beneficial arrangement.

Response to Letter 24

24-1 Partial backfilling of the pit is discussed in the alternatives section of the Final EIS. Completely backfilling the pit was considered, and rejected as unfeasible. Please refer to new Section 2.2.6.

24-2 Please refer to General Comment No. 5 - Reclamation and Post-Closure Site Management Committee.

24-3 Please refer to General Comment No. 2 - Hydrology.

24-4 Stripping cover soil from otherwise undisturbed areas is considered a questionable practice in this area. As described in General Response No. 5 - Reclamation and Post-Closure Committee, the BLM will organize a team to evaluate reclamation techniques to optimize rehabilitation of the site.

24-5 The test plot research program developed during the life of the operation will determine site-specific revegetation techniques best suited for successful reclamation of the site. An independent committee will be formed to evaluate the reclamation program and make recommendations to the BLM regarding methods of monitoring, which will be site-specific to the project environment. Please refer to General Response No. 5 - Reclamation and Post-Closure Site Management Committee.

Letter 24 continued

A clear, quantitative monitoring program for revegetation is needed. Again, the Castle Mountain project plan is a good model.

24-6 4. Consideration should be given to placing overburden as a base at the main leach pad site instead of dumping it at the small western dump site proposed.

24-7 5. The wildlife protective measures to prevent access to the leach pads and ponds are are designed only to prevent entry of large animals. Experience at many Nevada and California heap leach operations indicates that this is entirely inadequate, human presence notwithstanding. Methods of enclosure such as adopted by the Mesquite Mine in California (heavy plastic covers for ponds) and the Castle Mountain project (leachate processing in tanks) save water and are economically feasible; they further protect all wildlife from exposure to toxic water.

Sincerely,

H G Wilshire

Dr. H.G. Wilshire
1348 Isabelle Ave.
Mtn. View, CA 94040

Response to Letter 24

24-6 Overburden and ore are mined concurrently, and the dump is constructed as ore is placed on the pad.

24-7 The two projects mentioned are both gold recovery operations which use cyanide. Cyanide ponds are required to be netted to discourage migratory waterfowl, which are protected under the Migratory Bird Act. Cyanide will not be utilized in AZCO's operation.

Letter 25

SIERRA CLUB

Grand Canyon Chapter · Arizona

Palo Verde Group
1628 W. Milagro
Mesa, AZ 85202

May 6, 1992

Larry Thrasher, Project Manager
Safford District Office
Bureau of Land Management
425 E. 4th Street
Safford, AZ 85546

Dear Mr. Thrasher:

Following, in no particular order, are the comments of the Palo Verde Group of the Sierra Club on the Draft EIS on the proposed Sanchez mine.

25-1 The underground mining option was considered and rejected as being unfeasible. However, no mention was made of the possibility of using the new technology of underground leaching, which has very little impact on the surface.

25-2 The mine's waste-rock dump will be visible from high parts of the Gila Box NCA three miles away, but no mention of noise impacts was made. The quality of that area will be degraded if blasting and the noise of rock dumping can be heard, even if the noise is far from being ear-splitting. Due to topography, it is possible that reflected noise (echo) will be heard in heavily-used parts of the canyon not visible from the mine.

25-3 We agree that it would be uneconomical to backfill the pit, if only because of the tremendous amounts of fossil fuels such an action would entail. The plan to revegetate parts of the area is laudable. However, the fact remains that 900 acres of land will remain barren essentially forever in return for a 17-year operation.

25-4 The Reclamation and Closure Plan should analyze a possible mitigating long-term dewatering program to deal with water flowing into the pit that might affect wildlife and water quality.

25-5 The waste rock disposal area will be unlined and could pose a significant threat to water quality due to acid drainage; more sampling and testing are needed.

The EIS mentions that domestic waste, including paper and wood, will be buried underneath the waste-rock dump. Is there any

Response to Letter 25

25-1 In situ leaching is not a proven technology for copper recovery, and may have significant impacts on groundwater.

25-2 Please refer to expanded noise information in Section 4.9 as well as Table 4-5.

25-3 Consolidation of the two heap leach pads has reduced the total disturbed acreage. Projected unreclaimed acreage is now estimated at 635 acres.

25-4 Please refer to General Response No. 2 - Hydrology.

25-5 Please refer to Appendix C - Report on Waste Material Testing.

Letter 25 continued

25-6 possibility of recycling these products instead? Paper is readily recyclable. Wood can be made available for home owners for small projects and hobbies.

25-7 Kit foxes are present in the area; are they a sensitive species? More details are needed on the future of bats that will be evicted from the old mines. Is suitable habitat available nearby? If not, will it be created?

25-8 It is disturbing that Phelps-Dodge has a potential mine, the Lone Star, that would be ten times the size of the Sanchez mine. Such a mine is likely to ruin any qualities not done in by the Sanchez mine. This should be kept in mind while approval of the Sanchez mine is being considered; it is less likely that the Lone Star will not be approved if the Sanchez goes ahead.

25-9 Beneficial impacts on the economy of the Safford area and Graham county, due to growth created by the 210 to 281 new jobs created by the mine, were mentioned. However, no mention was made of possible economic losses that might be caused by the mine. The presence of a large mine and its impacts, especially visual, might discourage other people such as retirees seeking a moderate climate in a small town from moving. This might more than offset the benefits of mining jobs that will be eliminated when the mine is closed two decades from now.

25-10 The BLM allows for major changes in visual quality. The area is considered to be of low scenic value, presumably due to the lack of deep canyons and steep cliffs. However, little mention is made of the negative impact of the mine on the broader general landscape (and quality of life) of the region. The mine is likely to be visible from many parts of lofty Mount Graham, which is one of the main tourist draws of the area; this was not brought up in the EIS. The sight of the mine from the highways and inhabited areas will give travelers a bad impression of the area, and residents a permanent eyesore.

25-11 The possibility of being able to do without this mine from an economic standpoint should be explored. Arizona already has several large mines; it should be determined if they can meet demand by increasing production. Also, the possibility of saving the annual production of the Sanchez mine through the far-sighted approach of copper recycling and conservation should be explored. The demand will still be there after the closure of the mine 17 years later, a blip on the time scale of humanity's industrial past and future.

Thank you for the opportunity to comment on this draft EIS.

Sincerely,

Fareed Abou Haidar

Fareed Abouhaidar
Palo Verde Group Conservation Committee

Response to Letter 25

25-6 AZCO will recycle some domestic waste, but there may not be a market for certain trash or wood waste.

25-7 Please refer to revised Sections 3.6 and 4.6.

25-8 The Phelps Dodge Lone Star Project has been considered in the cumulative impacts sections of the Draft EIS.

25-9 Speculation regarding preferences of non-local retirees is beyond the scope of this document.

25-10 As stated in Sections 3.9.1 and 4.9.1, the designated visual classification for this area (Class IV, rated "C") allows for major modifications of the existing character of the landscape.

25-11 Please refer to General Response No. 4 - Public Lands.

Letter 26

MINERAL POLICY CENTER

• P. O. BOX 2998 • DURANGO, COLORADO • 81302 • 303-385-6751 •

May 5, 1992

Larry Thrasher, Project Manager
U.S.D.I. Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, Arizona 85546

Re: Draft Environmental Impact Statement--Sanchez Copper Project dated March 1992

Dear Mr Thrasher:

The following are the comments of Mineral Policy Center ("MPC") to the Draft Environmental Impact Statement--Sanchez Copper Project dated March 1992 (the "DEIS"). Our discussions and contentions below are organized under four sections: (1) Brief Statement of MPC's Position; (2) Sufficiency of Mining Plan of Operations (the "MPO") under BLM Surface Management Regulations; (3) Sufficiency of DEIS under the National Environmental Policy Act ("NEPA") and Its Implementing Regulations; and (4) Conclusion.

Brief Statement of MPC's Position

The MPO as characterized in the DEIS fails to provide for measures--including measures during operations designed to mitigate impacts and reclamation measures--necessary to avoid unnecessary and undue degradation of lands and resources, including lands and resources within the project area as well as those outside the project area. Therefore, the MPO is insufficient under BLM Surface Management Regulations at 43 CFR Subpart 3809 and should not be approved.

26-1 Further, the DEIS fails to address concerns raised by MPC during the scoping process, to give a full and fair discussion of significant environmental impacts, all reasonable alternatives, and all points of view on significant impacts of the alternatives and the action as proposed. The inadequacies of the DEIS in these regards are such that BLM must revise the DEIS and recirculate same for public review and comment.

Sufficiency of MPO Under BLM Surface Management Regulations

The BLM Surface Management Regulations set forth a policy that at all stages of mineral development, from exploration, throughout development and extraction operations, to closure and reclamation, measures must be taken to "prevent unnecessary and undue degradation" to lands and resources both inside and outside of the

Response to Letter 26

26-1 In the Final EIS, the Mineral Policy Center's comments are addressed in the following sections:

Hydrology .... Sections 3.3 and 4.3
Liners .... General Response No. 8
Netting .... General Response No. 7
Reclamation .... Section 2.1.9

Larry Thrasher, Project Manager
May 5, 1992
Page 2

project area. See 43 CFR §§ 3809.0-6 and 3809.1-5(c)(5). The latter section makes it clear that, on its face, an MPO--and the reclamation measures it describes--must meet the unnecessary and undue degradation standard (hereinafter, the "UUD Standard").

26-2

Before discussing the sufficiency of the MPO under the UUD Standard, a few important facts must be noted. First, the project facilities are all located within the Gila River drainage, the center of the ore body less than 2 miles to the north of, and about 150 higher in elevation than, the right-hand bank of the river.

Second, most if not all of the project area overlies at least one of two major aquifers in the area, one of which (upper aquifer) is an important source of agricultural water and is directly connected to the Gila. The other (lower) appears to feed the upper aquifer and therefore has indirect connection with the Gila.

26-3

Third, the proposed pit will intersect saturated conglomerate of the lower aquifer at 159 feet below the surface (see Fig. 2-5 at p. 2-13, Tbl. 3-4 and Fig. 3-5 at pp. 3-19 & -20 of DEIS) and is expected to flood after closure (see Preliminary Permitting Study at p. 71). Because so little is known about subsurface conditions within the project area itself (see discussion, infra), the possibility that project facilities, structures and/or excavations might impact the upper aquifer as well has not been ruled out. As the DEIS states:

> Upper channel fill alluvium in the pit area could be hydrologically connected to the flood plain deposits of the Gila River.

See DEIS at p. 4-8. The same holds for the waste rock disposal area, which will be unlined (see DEIS at p. 4-9), and the leach pad, which will have a clay but not synthetic liners and will be located immediately upgradient of Head Canyon, a drainage that may connect with both aquifers (see DEIS at pp. 3-21 and -22).

26-4

Finally, it should be noted that the foregoing factual conclusions are exceedingly difficult to determine from the DEIS and the MPO because the analysis and descriptions of hydraulic data are carved up and the pieces distributed about in 3 separate sections of the DEIS and in documents not included with the DEIS.

However, after piecing the discussion together, one realizes that many if not most of the conclusions about surface and subsurface water reached in the DEIS are based on information derived from sites located several miles away from the project area, such as Bonita Creek (see DEIS at pp. 3-21, -24 and -25), and that nearly all groundwater data was generated from samples drawn 20 to 30 years ago from wells drilled several miles away in

26-2 Field studies conducted by GSi/water (September, 1992) report the presence of three primary aquifers within the project area; the Upper Gila Conglomerate Aquifer (upper aquifer), the Lower Gila Conglomerate Aquifer (lower aquifer), and the Bedrock Aquifer. Additionally, GSi/water differentiates the Upper Gila Aquifer into those sediments being associated with the Gila River itself (Upper Gila) and those being associated with the tributary channel from the proposed pit area (Upper Gila Conglomerate). The Upper Gila sediments have a significantly greater permeability than those of the Upper Gila Conglomerate. Alluvium in the proposed mine area is dry.

26-3 Figure 3-2 illustrates where the proposed operations lie with respect to various surface geologic features. The nature of shallow, unconfined alluvial aquifers is that generally all areas of exposed alluvial materials can provide a source of recharge to the underlying unit, providing climatic and geologic conditions favor it.

Recent test pumping and calculations indicate that the pit will not flood after closure. Ephemeral ponds may develop in the pit bottom from time to time during periods of high precipitation.

The statement regarding upper channel fill alluvium in the pit area possibly being hydrologically connected to the Gila River floodplain is a true statement. However, just because the **mechanism** for hydrologic connection is present (adjacent alluvial materials with the ability to conduct fluids) does not mean actual connection has occurred or occurs perennially. The ephemeral nature of precipitation events in the project area severely limits natural sources of recharge. As stated in the Draft EIS on page 4-8, "drill hole data indicate a lack of groundwater in alluvium in the vicinity of the planned pit". Neither pit operations or the waste rock disposal will introduce a new source of recharge to the alluvial aquifer. Leach pad operations will be protected by a clay liner system designed and constructed in accordance with "best available demonstrated control technology" (BADCT) for copper heap leach pads as defined by the Arizona DEQ. Utilization of this technology will additionally protect the lower units. The new leach pad location is no longer upgradient of Head Canyon. It is now located on the terrace west of Head Canyon and is hydrologically isolated from the Lower Gila Conglomerate aquifer by approximately 500 feet of lacustrine clays and silts.

Larry Thrasher, Project Manager
May 5, 1992
Page 3

26-4 cont'd

unrelated drainages (see Table 3-4 and Figure 3-5 of the DEIS).

In summary, despite the copious tables and the hydraulic commentary thereon in the DEIS, the truth is that the hydrogeology of the project area and the drainages the project is likely to affect are essentially unknown.

In light of what is known about the site, and especially what is not known, the MPO fails the UUD Standard in the following respects:

26-5

(1) Leach pad design does not call for double HPDE liners, fails to describe leak detection systems and response procedures, and fails to require installation of monitoring wells and adoption of a monitoring plan to be followed during and after operations.

26-6

(2) Solution and raffinate pond and channel designs require only 40 rather than 60 mil liners, fail to describe leak detection systems and response procedures, and fail to require installation of monitoring wells and adoption of a monitoring plan. These designs also fail to require protective netting to exclude birds and bats from leaching solutions.

26-7

(3) The acid-generating potential ("AGP") of waste rock is based on two tests, one performed on only 60 lbs. of material (1989) and another--not even mentioned in the DEIS--on 150 lbs. (1991). These reports do not describe or map the locations of sampling sites or the drill pattern or depth of sampling holes. However, it appears from both reports that core samples were quite few in number and therefore may not be representative of the entire area that will be disturbed or excavated. From the DEIS and the MPO it appears that little if any testing for AGP or toxic metals has been performed for the ore body itself or for the soils underlying the proposed leach pad, solution and raffinate ponds, or the waste rock dump site.

26-8

Thus, the MPO is insufficient by failing to adequately protect surface and groundwater, to require procedures for testing waste and other disturbed materials for toxic elements during or after operations, or to require installation of monitoring wells downgradient from same. Without better information on AGP and potential constituents of concern such as toxic metals and or sulfates, the MPO should have required capping the waste dump and then revegetation after closure, as well as the exhausted ore heap and the leach and raffinate ponds.

26-9

(4) Processing facility designs (see figure 2-11) fail to require groundwater protection, monitoring wells and monitoring plan to followed during and after operations. Similar mitigation measures are also absent for processing chemical and fuel storage

26-4 Please refer to General Response No. 2 - Hydrology and Sections 3.3 and 4.3.

Due to the size of many of the referenced documents, it is not possible to include the entire reports within the context of the Final EIS. We have attempted to include all relevant data from these reports in the revised Final EIS, and will make the entire reports readily available for review upon request.

Modern, site-specific data have been collected at the proposed mine site to serve as baseline information (GSi/water, September 1992).

26-5 An operational groundwater monitoring system has been proposed by GSi/water and is presented in their report dated September 2, 1992. Additionally, a groundwater monitoring and response plan has been prepared by Mining & Environmental Consultants (M&EC, September 1992) that is designed to address the concerns and requirements of the State of Arizona Aquifer Protection Plan (APP). Both of the monitoring plans have been incorporated in the Final EIS as Appendix D - Monitoring Plan.

26-6 Please note that the solution and raffinate pond designs require a primary 60-mil HDPE liner over a secondary 40-mil HDPE liner with a geotextile drainage net placed between the two liners. This provides superior protection over a single 60-mil HDPE liner. The process solution ponds and overflow pond will also be equipped with a "weepage detection/collection system" that will be monitored on a weekly basis (M&EC 1992). Additionally, General Response No. 7 - Migratory Bird Netting describes the possible placement of nets over site ponds should regulated migratory birds utilize the ponds.

26-7 See Final EIS Appendix C - Report on Waste Material Testing.

26-8 A groundwater monitoring and response plan has been prepared by GSi/water and Mining & Environmental Consultants which is designed to address the concerns and requirements of the State of Arizona APP. It has been included as Appendix D in the Final EIS document.

Letter 26 continued

Larry Thrasher, Project Manager
May 5, 1992
Page 4

26-9 cont'd areas. The MPO fails to require grading throughout the site so that, during and after operations, surface runoff will be directed away from all facilities that may contain contaminants or toxic residues that might pollute surface and/or groundwater.

26-10 (5) The MPO fails to describe surface and groundwater quality monitoring for pit area during and after operations. As noted above, the pit will intersect subsurface flow, and yet the MPO fails to describe where water from dewatering procedures will be deposited or whether such waters will be tested for contaminants or toxic substances. Further, as AZCO's experts stated in their Preliminary Permitting Study at p. 71, "Effective mitigation of groundwater aquifer effects would require a long-term commitment to pump system operations. Current mine operations do not anticipate continued pumping after mining has ceased." (Emphasis added.) Neither the MPO nor the DEIS discusses how the pit will be dewatered after closure. Neither document discusses any mitigation measures to prevent water seeping into the pit from contaminating groundwater, or how that water will be monitored for contaminants or toxic substances.

26-11 (6) With respect to all of the foregoing 5 points, the MPO fails to provide for any comprehensive, long-term monitoring plans, action or threshold levels for constituents of concern, or contingency plans or response procedures to be followed in the event monitoring discloses surface or groundwater contamination. Although the MPO contemplates some sort of detoxification procedures for solution ponds and the leach pad (see DEIS at p. 2-33), it does not describe those procedures for the solution pond, it does not require testing leached ore or materials left in the ponds for AGP, and it does not describe what will be done if such tests reveal AGP.

26-12 (7) The reclamation bond (Appendix A of DEIS) is calculated without regard to any of the points raised hereinabove. Implementation of long-term monitoring and installation of structures to prevent flooding of the pit post-closure will involve significant costs ignored in AZCO's calculations. Therefore, the bond must be recalculated and increased accordingly.

26-13 Because the MPO fails the UUD Standard for the reasons described above, approval of same should be withheld. Formulation and implementation of appropriate mitigation measures and facilities addressing all of the foregoing concerns should be imposed as preconditions to approval of an MPO for this project. In connection therewith, prior to approval of an MPO AZCO should be required to acquire data on subsurface conditions, baseline water quality, and AGP so that any proposed operations can be adequately evaluated and environmental risks minimized or eliminated.

Response to Letter 26

26-9 Groundwater monitoring is described in the groundwater monitoring and response plan as noted above. The diversion of surface water around the leach pad and ponds is described in the Mining Plan of Operations (MPO) on page 33. The processing chemical and fuel storage area (tank farm) is protected by secondary containment of the individual tanks. The entire tank farm area will drain to a sump which has a volume sufficient to handle anticipated process spills. A pump will route spilled materials back to the appropriate source location (see MPO pages 44-46). Drainages associated with planned roadways are described on page 48 of the MPO, with additional drainage control plans described on pages 65-69 of the MPO. Monitoring and control plans are presented in the Final EIS as follows: Appendix D (groundwater monitoring); Section 2.1.8.4 (drainage control); Section 2.1.7.2 (reagent and fuel storage); and Section 2.1.7.4 (spill control).

26-10 Calculations provided by GSi/water (1992) indicate that during pit development, inflows from the Upper Gila Conglomerate and Bedrock aquifers could be up to 170 and 250 gpm, respectively, These flows are expected to decrease to very low values once initial dewatering has occurred. These flows also would not occur concurrently, since as the pit is developed, the Upper Gila Conglomerate aquifer would experience local dewatering long before the full inflow potential of the Bedrock aquifer has been developed. The anticipated post-closure inflow is 9 to 250 gpm, primarily from the Bedrock aquifer. GSi/water also calculates that the outflow from the pit due to evaporation will be approximately 710 gpm. Ponding, therefore, would only occur ephemerally in the pit in response to significant precipitation events. However, utilizing initial GSi calculations, potential inflow to the pit from the Upper Gila Conglomerate and associated Gila River aquifers could continue perpetually at up to 170 gpm. Potential inflow from the Bedrock aquifer could continue perpetually at up to 250 gpm. Significant evaporation would also continue.

26-11 A groundwater monitoring and response plan (Final EIS Appendix D and Section 4.3.1.1) has been prepared by Mining & Environmental Consultants which is designed to address the concerns and requirements of the State of Arizona Aquifer Protection Plan. Please see Final EIS Appendix C for discussion of materials testing.

26-12 The reclamation bond calculation for surface disturbance is adequate, and Arizona DEQ will also require an additional bond to complete reclamation of the processing facilities which are under Arizona DEQ jurisdiction.

26-13 Please see revised Sections 3.3 and 4.3 as well as Appendix C of the Final EIS.

Larry Thrasher, Project Manager
May 5, 1992
Page 5

Sufficiency of DEIS Under NEPA and Its Implementing Regulations

26-14 The DEIS was prepared pursuant to the National Environmental Policy Act of 1970, 42 USC §§4371, et seq. To implement that Act, the Council on Environmental Quality ("CEQ") has published regulations to be followed by federal agencies. CEQ's regulations are found at 40 CFR parts 1500-1508, and all citations below to various section numbers refer to the CEQ's regulations found in that volume of the Code of Federal Regulations.

The DEIS fails to meet the requirements of CEQ's regulations in several respects noted below. I would note first, however, that although what is being examined here is only a draft EIS, it must nevertheless meet the requirements established in the regulations for final EIS's. See §1502.9. I would also point out that the mitigation measures I describe in the preceding section and in prior comments in scoping as being necessary but absent from the MPO constitute "alternatives" to the proposed action within the meaning of NEPA.

The DEIS fails to meet the CEQ's regulations in the following respects:

26-15 (1) Under §1502.9(a), the DEIS must "disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternatives including the proposed action." As you know, during the scoping process MPC submitted several comments and concerns on the proposed action, contending that, among other things, the MPO should provide for pit dewatering, netting over the solution and raffinate ponds, a synthetic liner under the leach pad, and long-term surface and groundwater monitoring plan and response procedures for the various project facilities. The DEIS ignores MPC's comments and concerns addressing these and other potential environmental impacts presented by the proposed action. See MPC's correspondence dated November 14, 1991, as amended on November 15, 1991, and MPC's supplemental comments dated February 3, 1992.

26-16 (2) Under §1502.13, the DEIS must "specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." The DEIS reveals a complete misunderstanding of this section of the regulations. See DEIS at pp. 1-3 and -4. Apparently BLM thought it was supposed to discuss the purpose and need of an environmental impact statement, rather than the purpose and need of the proposed action (i.e., the Sanchez Copper Project as described in the MPO). The DEIS must specify the purpose and need of the latter, not the former.

26-14 BLM has responded to MPC's substantive comments in Sections 3.3 and 4.3 of the Final EIS as well as in General Responses No. 7 and 8.

26-15 Please see Section 2.1.5.6 (pit dewatering), General Response No. 7 (netting), General Response No. 8 (liners), Response 26-10 (pit flooding) and Appendix D (long-term surface and groundwater monitoring). These issues represent the concerns raised by Mineral Policy Center during the scoping process. All these issues were discussed in the Draft EIS and are fully addressed in the Final EIS.

26-16 Please see Section 1.2 of the Final EIS.

Letter 26 continued

Larry Thrasher, Project Manager
May 5, 1992
Page 6

26-17 (3) Under §1502.14(a), the DEIS must "[r]igorously explore and objectively evaluate all reasonable alternatives... ." As noted above, our scoping comments described a number of alternatives to the action as proposed in the MPO. For instance, our comments called for liners under the leach pad, netting over solution and raffinate ponds, leak detection systems, pre- and post-closure monitoring plans, and pit-dewatering after closure. However, the DEIS addresses none of these alternatives in significant detail, if at all.

26-18 (4) Under §1502.15, the DEIS must discuss "the environmental impacts of the alternatives including the proposed action... ." As noted immediately above, the DEIS did not even describe MPC's proposed alternatives, much less the environmental impacts they would present.

Rather, the DEIS addresses a limited number of alternative facility designs and actions but ignores or brushes lightly over many of the most important impacts presented by the project, such as AZCO's apparent intent to allow the pit to flood after closure and to abandon the project without a long-term surface and groundwater monitoring programs. As for post-closure pit flooding, the DEIS vaguely suggests that this may happen, and that some kind of diversion wall might be used to redirect flows around the pit--but it does not say that such a wall will be used or what it would look like, or assess the chances that such a wall would even work. For that matter, none of the concerns expressed above under the section addressing the sufficiency of the MPO under BLM's Surface Use regulations are examined for their environmental impacts.

26-19 The DEIS notes that the area of disturbance encompasses underground workings from extensive historical mining. There is no examination of those earlier workings in the DEIS--whether any mining residues from said operations might be mobilized by AZCO's operations, or whether tunnels and adits from historical mining in the area might flood as a result of altered subsurface flow patterns. The DEIS also fails to evaluate and describe the sampling and testing procedures used to determine AGP and/or the presence of toxic metals. In short, far too many very foreseeable environmental impacts that will result or may result from the proposed action are altogether ignored or overlooked.

26-20 (5) Under §1502.21, if a DEIS incorporates materials or documents by reference, "the material shall be cited in the statement and its content briefly described. No material may be incorporated unless it is reasonably available for potentially interested persons within the time allowed for comment." The DEIS relies on several extraneous documents, some of which were made available to MPC upon request.

Response to Letter 26

26-17 Please see Response 26-15.

26-18 Please see Response 26-10 and Appendix D of the Final EIS which address potential post-closure pit flooding and surface and groundwater monitoring programs.

26-19 The historic underground workings and adits are dry.

Please see Appendix C - Report on Waste Material Testing for a description of the sampling and testing procedures used to determine AGP and/or the presence of toxic metals. The testing procedures conclude that the material is non-acid-generating.

26-20 All materials or documents incorporated by reference in the Final EIS are either attached as appendices to the Final EIS or publicly available for potentially interested groups to review. In addition, please see: 1) Section 4.3.1.1 of the Final EIS which provides the information to be analyzed in the Arizona DEQ Aquifer Protection Plan permit application, and 2) Appendix D of the Final EIS for a description of the solution pond leak detection and monitoring system. Appendix D also describes embankment design, solution pond detoxification and toxic material removal, and measures to protect groundwater quality downgradient from the waste dump area.

Larry Thrasher, Project Manager
May 5, 1992
Page 7

However, in many important respects it appears that AZCO is relying on documents that do not yet exist or are only now being prepared. It is clear from the DEIS that rather than address the groundwater impacts and mitigation measures in the NEPA and MPO-approval processes, analysis of these impacts and consideration of alternatives are being deferred to the Arizona Department of Environmental Quality ("ADEQ"). In other words, AZCO appears to be of the belief that if alternatives and potential impacts will be analyzed in a permit application, or addressed in conditions imposed by ADEQ in an aquifer protection permit, they need not be analyzed in an environmental impact statement.

26-20 cont'd

For example, at page 2-20 of the DEIS, AZCO chooses not to analyze or describe a leak detection and monitoring system for the solution ponds except to say that it will be one "approved by Arizona DEQ and BLM." The same goes for liquid-containing or overflow embankment designs and construction (see p. 2-23 of DEIS), solution pond detoxification and toxic material removal (p. 2-33 of DEIS), and measures to protect groundwater quality downgradient from the waste dump area (p. 4-10 of DEIS).

The point here is that NEPA and CEQ regulations do not excuse analysis of foreseeable impacts and alternatives in the DEIS just because the same issues and concerns will eventually be addressed in another document--a permit application and supporting reports--to be filed at some future date with a state agency. Permitting by the ADEQ is an entirely separate process and is not intended to supplant NEPA's provisions of public review and comment and the analysis of alternatives and impacts by this agency, the BLM. The DEIS is grossly flawed in this respect.

26-21

(6) Under §1502.22, where there are "gaps" in information bearing on issues addressed in the DEIS, the DEIS "shall always make clear that such information is lacking or that uncertainty exists." As state above, there are numerous gaps in the information relating to subsurface conditions, AGP of disturbed materials, baseline groundwater quality in and around the project, and the general subsurface hydraulic regime. The DEIS does not flag this problem, but instead diverts attention away from it by referring with confidence to data generated from distant testing sites.

The same section of the CEQ's regulations states that where there is a gap in information "essential to a reasonable choice among alternatives" and obtaining such information would not be exorbitant, then it must be obtained and included in the statement. Here, there has been no showing that the cost of obtaining the missing data would exorbitant. It is certainly essential to an effective evaluation of the operations, decommissioning and reclamation measures contemplated by the MPO, and it should have

26-21 The Final EIS includes the additional information which §1502.22 requires agencies to Include in an environmental Impact statement. Please refer to Sections 3.3 and 4.3 as well as Appendix C of the Final EIS.

Letter 26 continued

Larry Thrasher, Project Manager
May 5, 1992
Page 8

been obtained and included in the DEIS as a matter of course.

Section 1500.1 of the CEQ's regulations states that the environmental information to be made available to the federal agency decisionmaker in the NEPA process "must be of a high quality," and that "[a]ccurate scientific analysis" is "essential
26-22 to implementing NEPA." Section 1502.9(a) of the CEQ's regulations states that where a draft EIS "is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion."

MPC submits that the DEIS, insofar as it attempts to address the alternatives and impacts described above, is "so inadequate as to preclude meaningful analysis" and must be revised.

Conclusion

For the reasons stated above, the operations contemplated by
26-23 the MPO and DEIS fail to meet the UUD Standard imposed by BLM's Surface Use Regulations. Therefore, the MPO, as it now stands, should not be approved. The DEIS fails to examine all reasonable alternatives and the environmental impacts of those alternatives and the proposed action. Critical gaps in essential information undermine the quality of the analysis and evaluations of the DEIS. Therefore, the DEIS should be revised and recirculated among interested parties.

Thank you, Mr. Thrasher, for the opportunity to participate and comment on this project.

Sincerely,

David A. Mullon Jr.

cc: Phil Hocker
Richard C. Moores, II
Lainie Levick

Response to Letter 26

26-22 Your observations will be considered during the decision-making process.

26-23 A Record of Decision (ROD) will be issued after the 30-day comment period for the Final EIS. The Mining Plan of Operations was an application to the BLM which will be amended after BLM review and analysis to meet BLM standards and regulations for environmental protection.

Bill & Lolene Brandau
P.O. Box 521
Safford, AZ 85548
May, 8, 1992

Larry Thrasher
BLM Project Manager
Safford DO, BLM
425 E. Fourth St.
Safford, AZ 85546

Dear Mr. Thrasher:

We are writing this letter as input to the Azco project EIS. We are land owners and residents quite near to the operation. Our property and residence is within a one mile radius of the majority of the mine activities and is unshielded by topography. Our property and our family will be directly impacted by the mine operation. We are also members of the Sanchez community and the larger Graham County community.

We realize the benefit to the larger community if all goes as planned and support the Azco project because of that. However, the Sanchez Community and ourselves will receive more than inconvenience as indicated in the local paper. We will be living with the mine and all the associated direct and indirect impacts day in and day out for the life of the mine and in to the future when it closes.

The major concerns we have are as follows: 1. Water Quality 2. Aesthetics 3. Social impacts 4. Access//Transportation 5. Reclamation 6. Direct impact to our property 7. Will Azco do what they say they will do? These will be discussed individually and are equally important.

27-1 1. Water Quality: I realize the EIS indicates there will be no significant impact for both ground and surface water. One area not discussed is post operation pit water and potential impact to ground water. After our wells are contaminated it is too late. There needs to be continual monitoring off site to anticipate problems before they move off public land. Surface water runoff may be a problem if the proposed diversion ditches and dikes are not maintained. After a break it is too late, our private land will be impacted. There is no discussion of who will monitor and/or maintain the facilities. Generally what assurance do we have that what is proposed will work, will be put in, its life expectancy, or its maintenance of usefulness during and after the mine closes. There are all important to assure that the private lands are not impacted.

27-2 2. Aesthetics: The majority of the EIS discussion is directed at impact to those far away and not close to the mine. Things

27-1 Please refer to General Response No. 2 - Hydrology, as well as revised Sections 3.3 and 4.3. AZCO has committed to a trust fund as described in Section 2.1.9.8 of the Final EIS.

Letter 27 continued

27-2 cont'd

such as shielding roads for noise abatement, blast monitoring, light shielding, reduced charges on blasting to reduce vibration, dust abatement, buffering private land from facilities and activities are not discussed as mitigation for impacts to local residents. Although, the aesthetic impact may be minimal to those far away, for those close there will be substantial impact and there should be some assurance of some mitigation for those impacts.

27-3

3. Social Impacts: The Sanchez area is a rural area that is about to become an industrial area. We would say that it is a substantial impact to a way of life for approximately 150 local people. To say these people should give up a lot for the good of the larger is not acceptable. A mitigation that Azco could do, is to be a good neighbor and, set up a way to communicate problems and potential solutions for local residents without these people being subjected to public ridicule in a biased public forum. This way a trust level could be built for both sides because we will be living together for a long time and we are sure there will be need of much discussion and action beyond this plan and the EIS.

27-4

4. Access/Transportation: This seems to be the only issue that has survived the public and private part of this process to date. The alternatives to access need to be looked at legitimately from a positive prospective rather than a short sighted expedient view. There are many more people living on the Sanchez Road than Azco. We advocate the option-2 in the EIS for these reasons.

a. Reduced safety and liability problems for both the residents and Azco.

b. Less dependence on the Solomon bridge.

c. It is all on Public land and could be in part a mine dedicated road and Azco would have control of who is on it.

d. Less flood susceptibility because it is higher on the slope and crosses fewer and smaller drainages. The Sanchez and Solomon bridge is impassable many times due to flooding.

e. If the maps are correct, Azco will have to construct a road above Head Canyon as part of their mine operations. The alternate access road could intercept this road, thus creating a loop. Loop access always seems to be better than dead-end access to reduce congestion.

f. The residents would benefit because of lessened traffic, potential accidents, hazardous waste spills on our private land, some mitigation on aesthetics. We are not advocating all traffic use the alternate, just the large trucks and some of the employees.

g. There is a high chance of increased traffic due to the

Response to Letter 27

27-2 No mitigation has been proposed for shielding roads, but the access route has been divided (General Response No. 1 - Access Route). Blasting must be of sufficient strength to break the rock, and this will cause unmitigable vibration and dust. Dust abatement will be practiced on haul roads. The facilities locations are not proposed adjacent to private lands.

27-3 As discussed in General Response No. 5 - Reclamation Committee, provision is made for involvement of local, concerned individuals in evaluating and directing reclamation efforts. Generally speaking, in the event that a problem arises with any concern which cannot be satisfactorily resolved with AZCO, the appropriate governing agency should be contacted. A compliance/enforcement officer will evaluate the problem and determine if a violation of permit conditions has occurred.

27-4 The access route has been modified from the original, proposed action. Please refer to General Response No. 1 - Access Route. Also, Section 2.1.1 has been revised to reflect the preferred alternative selected by BLM. This preferred alternative took into account your expressed concerns regarding human health and safety as well as quality of life.

27-4 cont'd

Gila Box NCA and the Dorothy B. Mine. This coupled with existing and Azco traffic, the alternate access makes a lot more sense. Phelps-Dodge's plans in the Gila mountains adds to the importance of the alternate access also.

h. If the distances were checked closely the alternate access is probably closer to the actual operations than the Sanchez road, particularly the leach pads.

i. One of the alternatives for the leach pad location and plant site, (figure 2-14), would be very well suited to the alternative access and really mitigate impacts to the local residents. It seems to be a good alternate to Azco. Less distance to Safford, closer to power, closer to their wells, don't have to transport material two directions for their process, less drainage problems, etc.

27-5 5. Reclamation: The plan seems to be to just close the operation down and walk away from it. What will be the mitigation for the pit water that remains long after Azco is gone? I understand a committee of local people and county representatives and Azco will plan for closure. The long term environmental issues must be a part of that planning, not just the quickest and easiest way to close things down.

27-6 6. Direct impact to our private property: Figure 2-12 indicates a new power line crossing approximately 1/2 to 3/4 of our private land. Nobody has ever talked to us about that. Are we going to be compensated or even have any input as to the location of the power line, or is it just going to be put in? The blasting vibration is supposed to be of no effect, but if it isn't, what recourse do we have? The value of my property is in question, what recourse do I have if the value is lost? Will the county lower my taxes? All of these are questions we have, but the EIS just overlooks impact or potential impact to private land and local residents.

27-7 7. Will Azco do what it says it will do: How are we as well as others assured and what recourse is there if Azco does not do what is proposed in this document? Dick Moores and Gary Fletcher were on our front porch last August and said they wanted to be good neighbors and work with the residents to address their concerns. Since that time to my knowledge Azco has made no effort to talk to, much less work with the residents to address their concerns. We know there has been public meetings to address issues, but you have to have the intestinal fortitude of an ox to stand up and say anything that might even challenge the plan because of the biased local political support! We live here also and are just as important as the people living in town and those who stand to receive direct economical benefit.

In closing, we hope that the local residents concerns will be taken seriously. We will be here long after Azco is gone and have to live with what they leave. In the interim, we are going

27-4 (Continued)
The alternative pad location was determined to be a better site. This alternative is now the preferred alternative for the heap leach pad location in the Final EIS, Section 2.1.6.1.

27-5 Please refer to General Comment No. 5 - Reclamation and Post-Closure Site Management Committee.

27-6 The power company has existing easements in the area. The final location of the power line will be based upon the best easement location to reach the facilities requiring power. Please refer to General Response No. 6 - Mining Claims as well as Sections 2.1.8.1 and 4.9.

27-7 Because of concerns expressed by local residents, several meetings have been held involving Sanchez Road residents, BLM, Graham County officials, and AZCO. A chronology of the meetings has been placed in the Summary of the Final EIS. Access road routes were modified as a direct result of meetings with residents along Sanchez Road.

The BLM Record of Decision will contain stipulations for compliance. One stipulation will require compliance with all other applicable local,

Letter 27 continued

27-7 cont'd. to have to live together. Hopefully this can be done where we all can benefit and not just some win and some lose. We believe this can be accomplished if all parties will "work together in good faith."

Sincerely yours,

Lolene Brandau

Bill Brandau

Lolene and Bill Brandau

Response to Letter 27

27-7 (Continued)
The BLM and Arizona DEQ will monitor and audit AZCO's compliance with the Plan of Operations and the Aquifer Protection Permit. AZCO will post a reclamation bond and a groundwater protection bond with each respective agency, providing enforcement of written conditions of the permits.

Letter 28

Hearold Elmer
3088 West 8th Street
Thatcher, AZ 85552

May 08, 1992

U.S. Department of Interior
Bureau of Land Management
425 East 4th Street
Safford District Office
Gila Resources Area
Safford, AZ 85546

Re: Environmental Impact Statement, Sanchez Copper Project

Gentlemen:

28-1 I have been involved in developing the Sanchez Copper Property as an owner for over 30 years. I have worked on the environmental studies as well as the other aspects of the mine with several of the major mining companies that have been involved with the Sanchez Property in the past.

I have helped with the work to develop this impact study and I believe we have covered all the "what if's", "but if's", "and if's", and all there other aspects of the complaints that the shade tree self appointed specialists are trying to raise.

They (clubs; will set back and yell more money for schools, more money for ecology, less taxes on us, and more jobs, yet they stand for every thing that tears down the economy and does away with jobs. They have cost this country more money, jobs and growth than any other group of people that ever existed.

Here is a list of things that none of us would have without utilizing the natural resources that God put here, and gave us the intelligence to make intelligent use of. These people are not Environmentalist or Ecologist they are extremist.

1. No Schools.
2. No Income.
3. No Cars or Transportation of any kind.
4. No Houses.
5. No Medical Facilities or Medicines.
6. No paved Streets.
7. No Running Water in our Homes.

1

Response to Letter 28

28-1 Thank you for your comment.

8. No Machinery of any kind to raise food.
9. No Canned Fruits, Vegetables or Meats or Packaging for other Foods.
10. No back yard Swimming Pools.
. No Television, Radio or Newspapers.
.. No Tooth Brusher or Hygiene Facilities.
3. No Paper Products, not even toilet paper.
14. No cutting of plants or trees to make Bows & Arrows.
15. No Cattle to do Natures Pruning of Plants.
16. No Shoes or Clothes.
19. No Telephones.
20. No Electricity.
21. No life as we know it today.

Who is going to have the money to support these extremist in a few years with all the jobs disappearing? I want them to face all the children that are going without because of their misconceptions of what this entails. A mining company cannot and will not stand by while allot un-necessary paper shuffling and delays are being formulated by the extremist.

All the precautions have been studied and taken to assure that this project will be Ecological safe, and all safety precautions have been taken.

Sincerely,

Hearold Elmer

Hearold Elmer

Letter 29

May 1, 1992

Dear Mr. Thrasher:

29-1 We are writing concerning the Azco Mining operation that is proposed in The Sanchez area. We are not opposed to the copper mine, we feel that Graham County will greatly benefit from it, however we personally do not believe that the Solomonville School District will benefit as much as had been projected, due to the change in legislature concerning school financing.

29-2 Our concerns are the access to the mine, the proposed changes and upgrading that the county has outlined would improve the road conditions but we feel are inadequate and will fall short for this project, especially when you look at the future, concerning other projects that are currently being looked into the area above the copper mine.

29-3 Our next concern would be possible contamination to either our ground water cropland as well as the area of vegetative growth between Gila River and our farm ground.

We currently have 4 wells that we use for irrigation and we plan to install one more. The well next to our home we chose to use the ground water that was available to us over the use of the city water, since 1986 and are still using it.

The water level ranges from a low of 30 feet to a high of

Response to Letter 29

29-1 Economic estimates were based on most recent data available for analysis.

29-2 Please refer to General Response No. 1 - Access Route.

29-3 Please refer to General Response No. 2 - Hydrology. AZCO has implemented a sampling program for existing groundwater wells on private lands adjacent to the project. Information regarding this program is presented in Section 3.3 and Table 3-9.

Letter 29 continued

15 feet. All of our water in these wells are derived from the upper aquifer.

29-4 We would hope the channeling of run off water around the leeching field would not increase the water flow through Head Canyon. My father owns a few acres north of the Sanchez Road, in Head Canyon. We own both sides of Head Canyon wash south of Sanchez Road to the Gila River. We understand from the Draft Environmental Impact Statement that we shouldn't have any problems, we sincerely hope that we do not for we plan on living here long after the mine closes down. What our questions are, "What happens if we do have problems in any of the areas that we have listed above?"

We would like to thank you for your concerns and the way that you are handling this project to meet the concerns of all those involved.

Sincerely,

David Clonts
Sharon Clonts

David Clonts
Sharon Clonts

Response to Letter 29

29-4 The project will not affect the size of the watersheds that feed Head Canyon or Big Canyon. Therefore runoff into these canyons remain substantially unchanged. The diversion ditches above the heap leach pad will intercept runoff and channel it to the respective drainage. Surface water runoff will be further regulated by a Storm Water Runoff Permit administered by the EPA. The company must comply with the conditions and/or stipulations in this permit.

Generally speaking, in the event that a problem arises with any concern which cannot be satisfactorily resolved with AZCO, the appropriate governing agency should be contacted. A compliance/enforcement officer will evaluate the problem and determine if a violation of permit conditions has occurred.

Letter 30

March 25, 1992

TO THOSE CONCERNED:

30-1 We, the undersigned, object in the strongest terms to any consideration of transforming the rural Sanchez Road into a thoroughfare of heavy traffic, and large, high speed trucks to accommodate the AZCO Sanchez Copper Project.

Access to the AZCO project should be from Safford to Safford Airport and north of airport to the leaching field, hence to the mine. This route would be much safer, faster, with no populated areas.

The Sanchez road is a curved, narrow road with blind curves and no passing double lines. There is one mile of the road that has no less than eleven homes, with the road sandwiched between the hill cliffs on the north, and on the south there is livestock and homes with yard fences on the very edge of the pavement and driveways which reverse onto the road itself.

The Sanchez road is a farm road with a continual flow of slow, wide farm equipment exiting and entering through gates, roads, etc., for access to the many various fields. Within a distance of four miles, there are approximately 24 homes (not including the homes in Sanchez itself) with the potential of the school bus stopping at each home twice a day, on the road.

To increase the traffic beyond those living in the area when there is an alternate route available would create an environmental and social economic condition that is totally unacceptable.

If Sanchez road is unwisely determined as the route of access we respectfully request this letter be kept on file for reference when property damage and loss of life occurs.

Thank you for your wise consideration,

NAME	ADDRESS	DATE
[illegible]	7701 E. Sanchez Road	4-2-92
[illegible]	7647 E. Sanchez Rd	4-2-92
[illegible]		4-2-92
[illegible]	Rt #1 Box 520	4-2-92
[illegible]	Rt 1 Box 514	4-2-92
Mr. & Mrs. [illegible]	Rt 1 Box 515C	4-2-92

Response to Letter 30

30-1 Please refer to General Response No. 1 - Access Route, and to revised Section 2.1.1. The access route has been modified from the original, proposed action. BLM has selected the preferred alternative in response to your valid concerns.

Page 2 - PETITION AGAINST ARCO USE OF SANCHEZ ROAD

NAME	ADDRESS	DATE
Debbie Clonts	Rt. 1 Box 519-A	4-2-92
Teri Linebarger	1701 East Sanchez	4-2-92
Diana Clonts	7047 East Sanchez	4-2-92
[illegible] Clonts	RT 1 Box 518	4-2-92
Sharon Clonts	Rt. 1 Box 518	4-2-92
[illegible]	Rt. 1 Box 517	4-2-92
[illegible]	Rt 1 Box 517	4-2-92
[illegible] Dominguez	Box 517 B	4-2-92
[illegible] Clonts	Rt 1 Box 516	4-2-92
Norma Clonts	Rt. 1 Box 516	4-2-92
Francisco [illegible]	Rt. 1	4 2 92
Juanita [illegible]		4 2 92
Dana Doshier	7007 E. Sanchez Rd	4-2-92
Rick Doshier	" " "	4-2-92
[illegible] Brandon	RT 1 Box 514B	4/25/92
[illegible] Brandon	Rt. 1 Box 514 B	4-25-92
[illegible]	9095 E Sanchez	4-25-92
Debra A. Scott	9095 E. Sanchez	4-25-92
[illegible] L. Boone	2509 N. Emerson Flat Rd	4-27-92
Eula M. Boone	2509 N Emerson Flat Rd	4-27-92
Betty Yankle	2802 N. Emerson Flat Rd	4-27-92
Warren Yankle	2802 N. Emerson Flat Rd	4-27-92
Tommy Clonts	Box 166 Solomon	4/27/92

Page 3. Petition against AZCO use of Sanchez road

Name	Address	Date
Betty Jean Clontz	Box 166 Solomon	4/27/92
Manuel Fajardo	10360 E Sanchez Rd	4-27-92
Amadeo Fajardo	10455 E Sanchez Rd.	4/27/92
Olivia Fajardo	10360 E Sanchez Rd	4-27-92
Elvira Fajardo	10455 E Sanchez Rd	" " "
Trinidad Sanchez	Rt. 1. Box 8.511 Safford, Az	4-27-92
Sylvia S. Coleman	Rt. 1. Box 511 Safford Az.	4/27/9
Frank G Rodela	PO BOX 211 Solomon AZ 85551	4-27-9
Aurora Sanchez	Rt. Box 511 Safford	4-27-
Arthur Rodela	P.O. Box 294 Solomon	4-27-
Lupe Rodela	PO Box 294 Solomon	4-27-
Terry Bowman	RT1 Box 529-B Safford	4/27/
Chris Bowman	Rt1 Box 529-B SAFFORD	4/27/92
Bruce & Stephanie Cecil	Rt 1 Box 529 SAFFORD	4/27/9
Marie Ortega	5377 E Sanchez Rd. Safford	4/27/9-
Terry L. Hughes	Rt. 2 Box 995-B Safford Az	4/27/9
Martha Romero	P.O. Box 97	Safford Az	4/27/9
Priscilla Mayfield	912 8th Ave Safford Az.	4/27/9

Letter 31

6056 N. Oracle Jaynes
Tucson, AZ 85741
May 11, 1992 Monday
602-742-4450

Meg Jensen
Bureau of Land Management
Safford District Office
425 E. 4th St.
Safford, AZ 85546

In Re: AZCO Mining Inc

Dear Ms. Jensen,

31-1 Take away people with a financial interest in copper mining and consider my view: I oppose mining on public lands. Mining kills plants and animals and is toxic to humans.

There should be no mining in national forests anymore.

There should be no grazing in the national forests.

There should be no logging on public lands.

Miners, loggers and ranchers have served us (and themselves) well up to now. Now we are experiencing a shift in consciousness as a people, and we realize that resources are limited and extraction policies are shifting gradually to shepharding and nurturing policies towards our public lands.

Any person in their right mind can see that unlimited economic growth (aka development) is insane, madness, not considerate of future generations.

Please assist me in creating a moritorium on these activities by subverting the development process in the same way Quayle's Council on Competitiveness willingly breaks the law in a strict law and order republican administration. Thank you.

Sincerely,

Mansur Johnson

Mansur Johnson

Response to Letter 31

31-1 Please refer to General Response No. 4 - Public Lands, as well as to General Response No. 6 - Mining Claims.

Letter 32

United States Department of the Interior

NATIONAL PARK SERVICE
Western Region
600 Harrison Street, Suite 600
San Francisco, California 94107-1372

IN REPLY REFER TO

L7617(WR-RP)

6 MAY 1992

Memorandum

To: State Director, Bureau of Land Management, Phoenix, Arizona

From: ACTING Regional Director, Western Region

Subject: **Sanchez Copper Project**, Draft Environmental Impact Statement (DEIS)

The National Park Service reviewed the subject document and has the following comments.

32-1 The proposed project is located within 100 kilometers of two National Park Service class I clean air areas, Saguaro and Chiricahua National Monuments, as well as two Forest Service class I areas, Mount Baldy and Galiuro wilderness areas. The DEIS indicates that the project will be a major stationary source of air pollution (816.9 tons per year of fine particulate matter (PM_{10}), 358.6 tons per year of nitrogen dioxide, and 335.5 tons per year of carbon monoxide), and probably subject to the Clean Air Act's Prevention of Significant Deterioration permit requirements. While the DEIS states that maximum pollutant concentrations would not violate Federal and state air quality standards, there is no discussion of class I increments for particulate matter, sulfur dioxide, or nitrogen dioxide, or the impact of the major source on those increments.

The DEIS contains no discussion of emission controls on the project's process, nor the source or sources of the gaseous pollutants. The project includes a steam generator (boiler) which will burn high sulfur content oil (No. 6 fuel oil). There is no description of the capacity of the boiler, air pollutant emissions (including sulfur dioxide) or emission controls. The larger mobile sources will be burning No. 2 diesel oil, which is not the cleanest burning fuel for those sources. No mitigating measures to minimize mobile source emissions are included in the DEIS.

Response to Letter 32

32-1 The proposed mine is not classified as a major stationary source; therefore, demonstration of compliance with all applicable PSD increments is not required by regulation. Emissions to which you refer are from mobile sources, and thus are considered to be fugitive emissions. States are obligated to track PSD increment consumption and take appropriate measures if increment violations are discovered. Some states are considering this obligation as the authority to require all permit applicants to demonstrate that increment will not be violated.

It is acknowledged that in general, both minor and major sources consume increment. However, the minor source baseline date must first be triggered before any minor sources impacting an area actually consume increments. Increment is defined as a maximum allowable increase over the baseline concentration. Emissions from all sources are included in the baseline concentration until such time that a complete major source PSD application is submitted, thus defining the minor source baseline date and corresponding baseline area. Baseline has not been triggered for Graham County; therefore, increment will not be consumed by the Sanchez Copper Mine, barring any change in this status prior to permitting.

Three Class I areas are located within 100 km of the mine site: Galiuro Wilderness Area (71 km), Chiricahua National Forest (86 km), and Chiricahua National Monument (97 km). All of these lands are located a sufficient distance from the site (over 60 km) that long-range scavenging of the ground-level particulate sources will result in negligible impacts to these Class I areas. The closest Class I area, Galiuro Wilderness Area, is located in Graham County, where increment consumption has not yet occurred.

Although the accuracy of dispersion models is considered to be questionable when predicting impacts out to distances beyond 50 km, the model was run for discrete receptors placed at these Class I areas to get an approximation of potential impacts. Preliminary modeling results yielded PM_{10} impacts below 0.75 µg/m^3 and 0.01 µg/m^3 for 24-hour and annual averaging periods, respectively. Modeling was also performed for TSP, SO_2, and NO_2. All impacts were found to be well below Class I standards.

2

32-1 cont'd. The DEIS contains no discussion of the potential impact of the project's emissions on the air quality related values (AQRVs) of the class I areas. AQRVs are air pollution sensitive resources, and include visibility, plants, animals, soils, water quality, and cultural and historic objects and structures. The Department of the Interior has certified to the Environmental Protection Agency that visibility at Saguaro and Chiricahua National Monuments is being adversely impacted by existing concentrations of air pollution from multiple sources (regional haze). The fine particulates emitted by the proposed project could exacerbate the visibility problem at those monuments. In addition, there are several species of plants at both monuments which are sensitive to ozone, including ponderosa pine, aspen, Douglas fir, and rhus trilobata. The nitrogen dioxide and volatile organic compounds emitted by the project's sources will react in sunlight to produce ozone. The ozone could have adverse impact on the plants of the class I areas. The DEIS should be revised to include discussions of all of the missing information.

/s/ Lewis G. Albert

cc:
Larry Thrasher
Project Manager
Safford District Office
Gila Resource Area
425 East 4th Street
Safford, AZ 85546

Office of Environmental Quality (WASO-774)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105

May 18, 1991

Larry Thrasher
Bureau of Land Management
425 E. 4th Street
Safford, AZ 85546

Dear Mr. Thrasher:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the Sanchez Copper Project, Graham County, Arizona. Our comments on this DEIS are provided pursuant to the National Environmental Policy Act (NEPA) and EPA's authorities under §309 of the Clean Air Act.

The DEIS proposes and evaluates development of the Sanchez Copper Project, an open pit copper mine and heap leach and solvent extraction/electrowinning processing. The proposed project would affect approximately 1,407 acres of public land.

33-0 We have rated the DEIS as EO-2 -- Environmental Objections-Insufficient Information (see enclosed "Summary of Rating Definitions and Follow-Up Actions"). Our rating reflects our objections to the proposed project's potential impacts on air quality. Our 2 rating reflects the need for additional information in the Final Environmental Impact Statement (FEIS) regarding impacts to air and water quality and biological resources, as well as facility design, monitoring, and reclamation.

We appreciate the opportunity to review this DEIS. Please send a copy of the FEIS to this office at the same time it is officially filed with our Washington, D.C., office. If you have any questions, please call Jeanne Geselbracht, Office of Federal Activities, at (415) 744-1576.

Sincerely,

Carolyn Yale (for D.)

Deanna M. Wieman, Director
Office of External Affairs

Enclosures
001188/92-076

cc: Donald Spencer, Arizona Department of Environmental Quality
Joan Scott, Arizona Department of Game and Fish

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Environmental Impact of the Action

LO—Lack of Objections
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC—Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO—Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU—Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1—Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2—Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3—Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

Air Resources

33-1 1. The estimates for PM10 (particulates smaller than 10 microns) emissions from the proposed project are based on several assumptions, including the following: (1) any PM10 generated from 200 feet or deeper below the rim of the open pit would settle to the bottom of the pit and "not leave the pit" (DEIS, p. 3-5); (2) dust control mitigation measures would be effectively implemented; and (3) although background air quality monitoring was not conducted at the Sanchez site, concentrations at other sites considered to be representive of Sanchez were used to estimate existing PM10 concentrations. We believe that these assumptions are unsubstantiated.

There is no evidence that PM10 generated in the lower 1000 feet of this 310-acre pit should be discounted from emissions calculations. In order to support emissions estimates, the FEIS should provide the calculations and **detailed** assumptions that were used, and indicate how the 200-feet depth was selected as the threshold for generation of PM10 that would leave the pit.

33-2 In addition, information in the DEIS regarding the implementation and effectiveness of dust control measures is vague. We recommend implementation of additional dust control measures such as blast hole optimization and stemming, minimization of drop height during ore and waste rock removal and transfer, and restricted vehicle speeds on haul and access roads.

33-3 The FEIS should provide estimates of unmitigated and mitigated emissions for each activity element. The FEIS should include a table summarizing projected PM10 emissions from activities such as blasting, drilling, truck loading, hauling, unloading, wind erosion, ore crushing, ore handling, and ore processing.

33-4 The maximum predicted PM10 concentration off-site is 144 micrograms per cubic meter (ug/m^3) over a 24-hour period (DEIS, Table 4-2). The Federal 24-hour standard for PM10 is 150 ug/m^3. Given the uncertainties associated with the assumptions in the DEIS, we believe that the emissions estimates may be unreliable and emissions could, in fact, exceed Federal standards.

33-5 The Clean Air Act prohibits any federal agency from taking any action that causes or contributes to violations of standards, or which interferes with attaining standards. If the proposed project would interfere with attainment of national standards, it would be prohibited by the Clean Air Act unless the preferred alternative is accompanied by air quality mitigation measures

1

33-1 A supplementary dispersion model has been performed which includes all PM_{10} from within the pit. See Section 3.1 in the Final EIS.

33-2 Modeling indicates that a minimum dust control efficiency of 70% is required for pit haul roads. Three water trucks may be needed to meet all of the road watering needs. Two water trucks are included in the initial equipment list in the Draft EIS. Additional road maintenance equipment will be added as the pit deepens. Chemical suppressants would be used in addition to water to achieve 85% efficiency on other roads. Total annual water usage for dust control is estimated to be 70 million gallons. The Draft EIS allows for 350 gpm for road watering and muck pile spraying, which is equivalent to 184 million gallons.

The EPA recommends implementation of blast-hole optimization and stemming, minimization of drop height during ore and waste rock removal and transfer, and restricted vehicle speeds on haul and access roads. These are all part of normal open pit operating practice and will be implemented.

33-3 This information is included in Table 4-1 of "Air Quality Analysis: Sanchez Copper Project" [EnecoTech, 1992]. In addition, this detailed PM_{10} emissions information has been included in the Final EIS.

33-4 The ISC2 model has been used, incorporating the latest information regarding AZCO's planned operations. Changes have been made to planned operations which have a substantial effect on PM_{10} and TSP emissions. Two million more tons per year of mined material will now be treated as ore and conveyed to the leach pad rather than hauled to the waste dump. Tertiary crushing has been eliminated and the crushing plant flowsheet simplified, reducing the number of transfer points. Ore will now be conveyed directly to the leach pad and placed by conveyor-stacker rather than by haul trucks.

The highest second-high predicted concentration, which is smaller than the predicted maximum, is used for comparison with the Federal 24-hour standard for PM_{10} of 150 µg/m^3. The model results from the ISC2 model predict the maximum 24-hour PM_{10} concentration to be 135 µg/m^3. Thus, the latest modeling results with the revised mining operations and improved air quality models indicate that 24-hour PM_{10} concentrations are below the Federal standards.

Letter 33 continued

33-5 cont'd. sufficient to offset all adverse impacts. The FEIS should include an assessment of proposed air quality mitigation effectiveness, and the Record of Decision should include a commitment to implement, monitor, and enforce appropriate, effective mitigation measures. We recommend that BLM consult with the Arizona Department of Environmental Quality.

33-6 2. The DEIS identifies other sites within ten miles of the proposed project site, which would generate similar pollutants (pp. 4-2 and 4-3). The FEIS should provide emissions estimates for other activities in the area. The FEIS should discuss how Prevention of Significant Deterioration (PSD) increments and National Ambient Air Quality Standards (NAAQS) would be affected on a cumulative basis.

33-7 3. The FEIS should discuss PSD increments applicable to air quality in the vicinity of the proposed project. PSD increments in Class I areas such wildernesses and national parks are highly protective of air quality. The PSD increments for total suspended particulates are 5 ug/m^3 (annual) and 10 ug/m^3 (24-hour). The PSD increments for sulfur dioxide are 2 ug/m3, 5 ug/m3, and 25 ug/m3 (annual, 24-hour, and 3-hour respectively). The FEIS should identify any Class I areas within 200 kilometers of the proposed site and discuss any potential impacts that the project would have on PSD increments. We recommend that BLM consult with the appropriate Federal agency such as the National Park Service or U.S. Forest Service regarding potential impacts to Class I areas.

33-8 4. Tables 3-3 and 4-2 provide projected air pollutant concentrations at an off-site point and at the closest residence. The FEIS should describe the specific locations of these points.

Water Resources

33-9 1. The DEIS states that the proposed pad/pond design, containment system, monitoring system and location minimize the potential for any significant impact on the hydrologic system, even in a worse case analysis. The DEIS does not substantiate this statement. Additional information is needed in the FEIS.

33-10 a. It is unclear from the DEIS whether the ditches directing overflow to the overflow ponds would be lined. The FEIS should include a description of ditch design and a discussion of the fate of storm overflow in the overflow ponds. The DEIS states that because the overflow pond would be used only occasionally, a single 40 mil HDPE liner is planned. The FEIS should identify maximum anticipated residence times in the ponds. It is unclear how leakage from the overflow ponds would be detected with a

2

Response to Letter 33

33-5 Thank you for your comment. Arizona DEQ has been consulted.

33-6 The model has been refined to address cumulative impacts, which are addressed in the Final EIS.

33-7 Please refer to Response 32-1 to the National Park Service for discussion of potential impacts to Class I areas.

33-8 The Final EIS describes all the locations where predicted maximum pollutant concentrations occur.

33-9 Please refer to Appendix E - Worst Case Scenario.

33-10 All process solution ditches will be lined, as described in revised Section 2.1.6.2 and Figure 2-4. Maximum anticipated residence time in overflow ponds is estimated at 30 days; however, solutions will be pumped back as soon as the event which caused the overflow is corrected or has ceased. The monitoring program mentioned is for normal operations. In the event of an emergency requiring the use of the overflow pond, an emergency monitoring program will be implemented.

scheduled monitoring program mentioned on page 2-20 of the DEIS. The FEIS should address this.

33-11 b. The FEIS should describe the locations of all monitoring wells on the proposed project site. We recommend that vadose zone monitoring devices such as suction lysimeters be installed and monitored on a regular basis. Locations and descriptions of all monitoring sites and points of compliance should be provided. The parameters to be monitored and monitoring frequencies should be discussed.

33-12 c. The FEIS should discuss contingency and remediation plans in the event of a leak or spill in which a discharge of pollutants to groundwater or surface water occurs. These plans could be included as an appendix to the FEIS.

33-13 2. According to the DEIS (p. 4-9), the bedrock has limited quantities of water and should produce limited quantities of water in the pit. However, this claim is unsubstantiated. As the DEIS states, there are no known wells completed in the bedrock aquifer in the immediate vicinity of the mine pit. In addition, water is expected to seep into the pit from the saturated conglomerate. Seepage could be reduced or eliminated by wells or a cutoff wall south of the pit (DEIS, p.4-8). The FEIS should: (1) provide quantitative estimates of uncontrolled seepage rates for each water-bearing stratum; (2) identify dewatering techniques and drawdown rates to be employed during pit excavation, as well as additional drawdown rates of groundwater for use in facility operations (including dust suppression); (3) provide modelling results for the dewatered impact zone; (4) discuss any potential impacts of dewatering and identify any wells, springs, or waters of the U.S. that could be affected; (5) estimate aquifer recharge recovery times.

33-14 3. According to the DEIS, the alternative groundwater disposal techniques would have low to medium impacts on surface water. It is unclear what these impacts would be. Given the uncertainty of seepage rates, there is a possibility that alternative disposal would be necessary. The FEIS should include a thorough analysis of the three alternative groundwater disposal techniques and identify the preferred alternative.

33-15 4. The FEIS should discuss how the leach tests were conducted on the waste rock and provide the results for each test.

33-16 5. The FEIS should provide projected chemical characterization of water in each of the ponds located at the project site, including projected water quality in the open pit following closure.

3

33-11 Please refer to Appendix D - Monitoring Plan.

33-12 Please refer to Appendix E - Worst Case Scenario.

33-13 Please refer to General Response No. 2 - Hydrology, as well as revised Sections 3.3 and 4.3.

33-14 The most recent hydrologic information indicates that excess groundwater will not be encountered in the pit. All groundwater intercepted in the pit will be needed for processing; therefore, none of the three alternative groundwater disposal techniques will be required.

33-15 Please refer to Appendix C - Report on Waste Material Testing.

33-16 This information is presented in revised Sections 2.1.6.2 and 4.3 of the Final EIS.

Letter 33 continued

33-17 6. The FEIS should describe all mitigation measures that would be implemented to control nonpoint source pollution of surface waters on- and off-site, including control measures for large storm events. Any sedimentation basins or check dams should be described in detail and depicted on site maps in the FEIS.

33-18 7. The DEIS states that there are numerous dry washes draining the proposed project area, most of which are considered waters of the U.S. The FEIS should identify and describe all waters of the U.S. that could be affected by the proposed project. A map depicting these waters should be provided. The FEIS should also discuss whether any of the proposed activities would require a Clean Water Act §404 permit from the U.S. Army Corps of Engineers. If so, the the FEIS should discuss whether the proposed project would comply with the Federal Guidelines for Specification for Disposal Sites of Dredged or Fill Materials (40 CFR 230), promulgated pursuant to Clean Water Act §404(b)(1).

33-19 8. The DEIS contains discrepancies in its discussions and figures regarding geology and hydrogeology, especially regarding the presence or absence of the upper alluvial aquifer in the vicinity of the mine pit. The FEIS should clarify these discrepancies. Examples include the following:

a. On page 4-8, the DEIS states that "[s]ince the known water table is 65 to 95 feet below the bottom of the channel fill alluvium, there should be no flow of water from the alluvium into the pit." However, on page 2-29, it is stated that "[w]ater will come from the shallow aquifer interception wells, which will be used to keep groundwater from flowing into the pit."

b. On page 4-11, the DEIS describes the upper aquifer as being located two miles away from the site.

c. The North-South geologic cross-section in Figure 3-3 is inconsistent with that in Figure 3-4.

Permitting Requirements

33-20 1. After October 9, 1993, the proposed solid waste disposal pit at the site must comply with the Criteria for Municipal Solid Waste Landfills at 40 CFR Part 258, which were promulgated on October 9, 1991. Municipal solid waste landfill units failing to satisfy these criteria constitute open dumps, which are prohibited under §4005 of the Resource Conservation and Recovery Act (RCRA). The FEIS should discuss how the proposed solid waste disposal pit would meet the criteria, which include provisions for siting, operating, design, groundwater monitoring and corrective action, and closure and post-closure care of the

Response to Letter 33

33-17 Please refer to revised Section 4.3.2.4. [TRC or M&EC will furnish]

33-18 Please refer to Appendix F - Waters of the United States.

33-19 In the Final EIS Sections 3.3 and 4.3 have been clarified and updated with recent, additional hydrologic data and analyses. Several figures have also been changed to resolve discrepancies.

33-20 Please refer to Appendix G - Mine Solid Waste Landfill.

Letter 33 continued

landfill, as well as financial assurance criteria. BLM should consult with Arizona Department of Environmental Quality's Office of Waste Programs regarding the required solid waste permit.

33-21 2. The FEIS should discuss whether any other actions related to the proposed project would be subject to RCRA regulations. The FEIS should also discuss how hazardous waste generated by the proposed project would be disposed.

33-22 3. Pursuant to 40 CFR Parts 122, 123, and 124, National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges; Final Rule (Federal Register, pp. 48012-13, November 16, 1990), a Storm Water Discharge Permit would be required for the proposed project. The FEIS should identify this requirement in Table 1-1.

Biological Resources

33-23 1. The DEIS indicates that human activity at the site would discourage waterfowl from landing on open ponds. We believe that this is highly unlikely. We urge BLM to require that all solution ponds on the site be covered to prevent waterfowl contact with the water. In addition, coverings should be monitored regularly to ensure integrity.

33-24 2. The FEIS should discuss whether the water quality in the open pit would ultimately pose threats to birds. If so, we recommend that BLM require netting or other reliable measures to prevent avifauna contact.

Reclamation and Bonding

33-25 1. We recommend that the reclamation bond not be released until all measures have been taken to eliminate any surface water and groundwater contamination as well as obviate any threat to water quality and biological resources. According to section 2.1.9.6 in the DEIS, the reclamation bond would be released when, in addition to completion of other activities, native vegetation has been established on reclamation areas. The FEIS should be revised to indicate that the bond would not be released until all vegetation has been successfully established. The FEIS should include the criteria that would be used by BLM to verify successful vegetation establishment as well as successful accomplishment of other required reclamation activities. The reclamation plan should be included as an appendix to the FEIS.

33-26 2. We disagree with the statements made on page 4-18 of the DEIS indicating that impacts to soil and vegetation would not be significant because mitigation in the form of reclamation would

5

Response to Letter 33

33-21 Please refer to the new Section 2.1.8.7 in the Final EIS.

33-22 BLM agrees. This permit requirement has been added to Table 1-1.

33-23 Waterfowl fatalities have been reported on cyanide ponds, but BLM is not aware of any reported waterfowl fatalities on copper solution ponds in Arizona. Netting is not proposed as mitigation for this project.

33-24 Please refer to General Response No. 2 - Hydrology.

33-25 Please refer to General Response No. 5 - Reclamation and Post-Closure Site Management Committee.

33-26 Please refer to General Response No. 6 - Mining Claims.

33-26 cont'd substantially reduce the impact. There would be a permanent loss of 900 acres of natural vegetation, which we believe is a significant impact to biological resources. It is unclear how the reclamation goals of (1) creating a post-mining topography that blends with the natural surroundings and (2) restoring the land to multiple use would be met with little more than one-third of the disturbed area restored. Given such a significant loss of acreage, we recommend that BLM consider the merits of requiring compensation, at a 1:1 ration, for permanently and temporarily lost habitat in AZCO's Plan of Operations.

Letter 34

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Post Office Box 1306
Albuquerque, N.M. 87103

TAKE PRIDE IN AMERICA

In Reply Refer To:
FWS/R2/FWE-HC

CONFIRMATION

Memorandum

To: District Manager, Safford District Office, Bureau of Land Management, Safford, Arizona

From: Regional Director, Region 2

Subject: Comments on Draft Environmental Impact Statement for Sanchez Copper Project (EC #92/0007)

The Fish and Wildlife Service (Service) has reviewed the subject document. We offer the following comments for your consideration.

General Comments

34-1 The document contains considerable detail on the status of groundwater in the vicinity of the proposed mine. Unfortunately, the detail is not clearly organized or presented. This serves to confuse the issue of risk to the usable groundwater from the proposed project. For example, there appear to be two aquifers in the area, however, at least four names for these aquifers are used in the text. In one section of the document (2.1.5.6) it is stated that "The upper aquifer associated with the alluvial depostis will not be intercepted by the pit highwall as illustrated — Figure 2.5. Figure 2.5 gives no indication of where the pit highwall is or which aquifer is intercepted. In section 2.2.8.3 the statement is made that water will come from the shallow aquifer interception wells, which will be used to keep groundwater from flowing into the pit." If the upper aquifer is not intercepted by the pit, why do we need shallow water intercept wells? We suggest the sections of the document that discuss groundwater be revised for clarity and consistency.

34-2 There is no discussion in the document of the risks of a toxic chemical spill into the Gila River at the 8th Street bridge. Given the numbers of trucks per day over the 17-year life of the project, an accident could occur. A plan to deal with the spill should be part of the documentation for this project. The plan should contain means of warning the local population and neutralizing or removing the chemicals.

34-3 Similarly, we are concerned about the possibility of a spill from the ponds connected with the leaching operation. The overflow pond reduces the risks, but there remain questions. For example, the winter and spring of 1991-1992 was abnormally wet. Is the overflow pond large enough to handle volumes from successive storms? If the ground becomes sodden, will the pond dikes be compromised? A map showing the route escaping leachate would take to the Gila River would be useful. Clarification of the actual distance to the river is

Response to Letter 34

34-1 These sections and figure have been revised for clarity and consistency in the Final EIS.

34-2 Please refer to Appendix E - Worst Case Scenario.

34-3 The solution and overflow ponds are designed to contain a 100-year, 24-hour storm event. This is consistent with agency and industry standards.

Letter 34 continued

District Manager, Safford District Office, BLM 2

also essential to understanding the potential risk. Even if the overflow did not reach the river, could it reach the upper groundwater aquifer and contaminate it? A plan to restore the river or the aquifer should be part of the documentation. Please address these issues in the final document.

34-4 The document should also contain a copy of the bat survey report prepared for the project. There should be information on the type of research to be funded for the bats and the availability of alternate roost sites. If the pit is left open, consideration could be given to creating new roosts in the sidewalls. A commitment to prevent wildlife access to all ponds that contain toxic chemicals should be part of the initial project mitigation. Bats often drink from ponds. Because of their small size and nighttime habits, mortalities may not be observed. We recommend that all ponds containing toxic substances be fenced and netted to prevent wildlife from reaching the water.

34-5 There should be a discussion of the mitigation to be done if the mine is closed before the ore body is depleted. Given the oscillations in the price of copper, it is not unreasonable to assume there is a likelihood of this occurring.

Specific Comments

34-6 Page 2-12, section 2.1.5.6. Please clarify the direction of flow in the upper and lower aquifers. Move the discussion of water use on page 2-29 to this section for clarity. Modify Figure 2-5 to be clearer as to the aquifers under discussion, and reflect wording in text.

34-7 Page 2-15, section 2.2.6.1. Why do the leach pads not have a non-clay liner? Is the clay liner adequate to protect the groundwater resources from contamination?

34-8 Page 2-15, paragraph 1. Is suitable clay present on the site? How many acres of additional disturbance would be required to provide this material?

34-9 Page 2-20, last paragraph. How will the overflow pond be drained?

34-10 Page 2-23, paragraph 4. Will control methods for burrowing animals be necessary to protect the integrity of the berms?

34-11 Page 2-29, section 2.1.8.1. Is there no backup power available for pumps in emergencies? If there is no power, what happens to the overflow ponds if rain continues?

34-12 Page 2-29, section 2.1.8.2. This section is confusing. If the upper aquifer reaches the pit, is it not also at risk from leachate accidents? Elsewhere in the document, it is said that the pit would intercept the deep aquifer, not the upper. Which is correct? Please clarify the water uses and the sources and amounts of water to be taken from each aquifer. Will the pumping cause a cone of depression that could affect flows in the Gila River ?

Response to Letter 34

34-4 The bat survey report is part of the Mining Plan of Operations, and is available to the public at the BLM Safford District Office. Bat research will be included in the stipulations of the Record of Decision. In contrast to cyanide ponds, there is no documentation of wildlife mortalities from copper solution ponds.

34-5 The reclamation bond will be initially based upon requirements for the first three years of disturbance.

34-6 Section 2.1.5.6 has been revised, and a new Figure 3-_ has been inserted in the Final EIS.

34-7 A clay liner meets Arizona DEQ's BADCT guidelines for groundwater protection. Please also refer to General Response No. 8 - Clay Liner v. Synthetic Liner.

34-8 Tests indicate that sufficient, suitable clay exists on the project site. An approximate additional 11 acres of disturbance will be required.

34-9 The overflow pond will be pumped back to the process solution ponds.

34-10 Control methods will be utilized to maintain the integrity of the facilities.

34-11 Back-up generators will be available.

34-12 This section has been clarified in the Final EIS.

Letter 34 continued

District Manager, Safford District Office, BLM 3

34-13 Page 2-32, section 2.1.9.1. Most of the land affected by this project will not be restored to a condition where multiple uses are viable. The leach pads and the rock waste pile will not completely revegetate. The pit will not be useful for grazing, recreation, or other uses. Who will maintain the fence around the pit so it does not become a safety hazard? Please justify further the reason the pit is being left open.

34-14 Page 2-47, section 2.2.5. Taking of soil from an undisturbed area of the site to put on the leach pads and waste rock piles is not acceptable mitigation. Desert communities recover very slowly from disturbance. Loss of additional acres compromises whatever site recovery will be accomplished. We would like to see the document contain a table showing the acres to be affected for each portion of the project. This should include acreage that would additionally be disturbed for mitigation of effects elsewhere. The table should also include the acres of each portion that would be mitigated as part of the project. Only native species of plants should be used in the revegetation. Introduced or naturalized plants are not acceptable for revegetation.

34-15 Page 3-12 to 15, section 3.3. What will be the effect of groundwater pumping by the project? Will the pumping of the deep aquifer obstruct or alter recharge into the area? How much water is expected to fill the pit once mining ceases? Will wells in the vicinity of the project be affected?

34-16 Page 3-21, section 3.3.3. Please select one name for each of the aquifers and use it consistently.

34-17 Page 3-22, Figure 3-6. How close does upper aquifer water come to the pit? Would spills into the alluvium contaminate the upper aquifer?

34-18 Page 3-35, section 3.5.1. Please correct spelling of griggii to greggii and Erodian to Erodium.

34-19 Page 3-40, section 3.6.1. Washside vegetation is considered desert riparian.

34-20 Page 3-43, section 3.6.3. Razorback suckers may pass downstream of the diversion dam during high flows. They have the potential to be in the Gila River downstream of the project site. Their potential presence needs to be addressed.

34-21 Page 4-12, section 4.3.1.4. If upper aquifer water can be intercepted at the pit, why is there no danger of pollution from spills or seepage from the leach pads or ponds?

34-22 Page 4-13, section 4.3.2. Will re-routing flood flows around the leach pads result in increased erosion of the drainages? Both flow volume and speed are likely to increase under the plan. Energy reducers (page 4-15) may help to reduce velocities, but the additional flows are likely to overflow the washes. Erosion of project structures, including the pond berms, could occur. We suggest that instead of concentrating the flows off the project area, that the flows be diverted into the normal channels below the ponds. This

Response to Letter 34

34-13 Earthen berms and barriers will replace the fence. The pit will remain open to expose potential new ore reserves as price and technology improve.

34-14 Undisturbed areas should not be stripped to provide cover soil for disturbed sites; therefore the alternative reclamation technique in Section 2.2.5 was not selected. Only native species will be used for revegetation.

34-15 Please refer to General Response No. 2 - Hydrology.

34-16 These clarifications have been made in the Final EIS.

34-17 Please refer to new Figure 3-3 in the Final EIS.

34-18 These corrections have been made in the Final EIS.

34-19 Thank you for your comment.

34-20 The project will not affect the Gila River.

34-21 This section has been revised in the Final EIS.

34-22 The diversion channels above the leach pads will intercept and route flood waters to the same drainages through which they would naturally flow. There will be no increase in flow or velocity in these drainages that would likely overflow the washes. The pond berms are located outside of the washes and would not be affected by flooding in the drainages. Thus, the desert riparian vegetation downstream will not be affected.

Letter 34 continued

34-22 cont'd. would also protect the desert riparian vegetation downstream in these washes. Given the problems with velocity and capacity in the proposed drainage channels, vegetation is not likely to establish there.

34-23 Page 4-50, section 4.12. Wildlife are not likely to live in the project area until the vegetation recovers. Given the reduced capacity of the project area for vegetation, wildlife populations will not achieve pre-project levels.

Thank you for the opportunity to provide comments on this project. If we can be of further assistance, please contact Lesley Fitzpatrick or Ren Lohoefener in our Phoenix Ecological Services Office (Telephone: 602/379-4720).

cc:
Director, Arizona Game and Fish Department, Phoenix, Arizona
Field Supervisor, Phoenix Ecological Services Office, Phoenix, Arizona

Response to Letter 34

34-23 One of the goals for post-closure reclamation will be to return much of the site to former productivity levels. This includes wildlife as well as other resources.

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA 22092

In Reply Refer To:
Mall Stop 423
DES 92/

MAY 1 5 1992

Memorandum

To: Project Manager, Bureau of Land Management, Safford Arizona

From: Assistant Director for Engineering Geology

Subject: Review of Draft Environmental Statement for the Sanchez Copper Project, Gila Resource Area, Safford, Arizona

We have reviewed the subject document and our comments are as follows:

35-1 The presence or absence of the shallow aquifer under the leach pad and the waste pad needs to be discussed. The presence or absence of the deep aquifer underlying the waste dump also needs to be specifically addressed. On page 3-25, values of transmissivity and hydraulic conductivity are discussed using the same units (gallons per day per foot). These units are incorrect for hydraulic conductivity which should be discussed as gallons per day per square feet or feet per day. The EIS should also address how ground-water seepage into the pit will be monitored when the mining operation is terminated.

35-2 The assessment of backfilling the pit does not address some potential benefits which might include enhanced rehabilitation of a larger land area, elimination of the pit as a safety hazard, possible restoration or ground or surface water links, elimination of water ponding that might contain toxic contaminants, and other possible benefits.

35-3 The effect of striping soil from areas surrounding the leach pads to provide additional soil cover for pad sideslopes should be further evaluated in terms of the thickness and characteristics of the soils.

James F. Devine

RECEIVED
MAY 2 1 1992

Copy to:District Chief, WRD, Arizona

35-1 Please refer to General Response No. 2 - Hydrology.

35-2 No benefit has been identified which would justify the estimated cost of $400 million to backfill the pit.

35-3 The alternative of stripping cover soil from otherwise undisturbed areas has been rejected.

Letter 36

THE STATE OF ARIZONA

GAME & FISH DEPARTMENT

2221 West Greenway Road, Phoenix, Arizona 85023-4399 (602) 942-3000

Governor
Fife Symington
Commissioners:
Gordon K. Whiling, Central, Chairman
Larry Taylor, Yuma
Elizabeth T. Woodin, Tucson
Arthur Porter, Scottsdale
Phillip W. Ashcroft, Eagar
Director
Duane L. Shroufe
Deputy Director
Thomas W. Spalding

555 N. Greasewood Rd., Tucson, AZ 85745 (602) 628-5376

May 18, 1992

Mr. Larry Thrasher
Project Manager
Safford District Office
Bureau of Land Management
425 E. 4th Street
Safford, AZ 85546

Dear Mr. Thrasher:

Re: Sanchez Copper Project; Draft EIS

The Arizona Game and Fish Department has reviewed the Sanchez Copper Project Draft Environmental Impact Statement (EIS), and we provide the following comments.

36-1 Water Quality Protection:
Because many species of wildlife are dependent on water, and because this project is so close to the Gila River, we believe it is critical that water quality is not impacted by this operation. Our Department does not have the expertise to evaluate water quality protection measures, but we urge BLM to insure compliance with all measures recommended by Arizona Department of Environmental Quality, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers to protect water resources from degradation from this project. Significant impacts to wildlife could occur if water resources are degraded by this mining and leaching operation.

36-2 Additionally, we are concerned about the clay liners proposed for the leach pads. We question whether the clay liners will provide adequate protection for insuring water quality safety. The ? porous quality of clay leads us to concerns that leach solution might seep into water sources.

Response to Letter 36

36-1 As part of the BLM compliance/audit program, the quarterly review of the project will include an analysis of each permit compliance program. Conditions/stipulations for each permit will be evaluated to ensure that AZCO is maintaining proper monitoring records and demonstrating compliance. This includes the Aquifer Protection Permit.

36-2 Please refer to General Response No. 8 - Clay v. HDPE. The clay will be compacted to an impermeability of 10^{7} cm/sec.

36-3 Mitigation:
BLM regulations for surface mining of public lands require that measures will be taken to prevent unnecessary or undue degradation and to reclaim disturbed areas [43 CFR 3809.1-5 (b)(5)] and to provide protection of nonmineral resources of federal lands [43 CFR 3809.0-2 (a)]. Reclamation includes reshaping of areas disturbed, application of topsoil, revegetation of disturbed areas so as to provide a diverse vegetative cover, and rehabilitation of wildlife habitat [43 CFR 3809.0-5 (j) and 3809.1-3 (d)(4)]. Failure to initiate and complete reasonable mitigation measures, including reclamation of disturbed areas, may constitute unnecessary or undue degradation [43 CFR 3809.0-5 (k)]. The National Environmental Policy Act requires that an EIS include appropriate mitigation measures [40 CFR 1502.14(f)], and defines mitigation to include avoiding, minimizing, rectifying, reducing, or compensating for the impact [40 CFR 1508.20].

36-4 The Draft EIS states that 1407 acres will be disturbed by the mining operation, but only 507 acres will be reclaimed. This means that 900 acres will be left in a highly disturbed condition. We understand that it may not be "reasonable" to reclaim those lands, but if those lands are not reclaimed, then some compensation should be made for the loss of wildlife habitat. Once these lands are disturbed for this operation, all other uses of these federal lands, including grazing, recreation, and wildlife use, are certainly lessened and probably voided.

36-5 These lands contain habitat that is of moderate value to wildlife. The Draft EIS discusses some of the wildlife species that are found in the area, and certainly other wildlife species also inhabit the area.

36-6 We are enclosing herewith the Arizona Game and Fish Department Wildlife and Wildlife Habitat Compensation Policy. We believe that this project will permanently impact 900 acres of Resource Category III habitat, and will temporarily impact another 507 acres of Resource Category III habitat. Mitigation should include compensation for permanent loss of 900 acres and temporal loss of 507 acres.

36-7 Reclamation:
We have several concerns about the revegetation plan. Because revegetation efforts are often unsuccessful, we fear that AZCO will not easily reclaim the land with native vegetation. The revegetation plan should include a requirement to meet success criteria which are based on successful reestablishment of native vegetation to some percentage of the pre-disturbance biomass per

36-3 Please see General Response No. 5 - Reclamation and Post-Closure Site Management Committee. The reclamation program outlined in Section 2.1.9 of the Final EIS meets surface management regulation 43 CFR 3809.

36-4 Please refer to General Response No. 6 - Mining Claims. Regulations do not require compensation of acreage. Also refer to General Response No. 5 - Reclamation and Post-Closure Site Management Committee. This committee will formulate long-term site management goals that will meet the needs of wildlife and other resources. Grazing may continue during and after the operation. Some segments of the recreation user group such as off-road vehicle (ORV) users may find the area an attractive alternative to the Gila Box. Certain wildlife species may be attracted to the rocky, unreclaimed side slopes and pit high walls for nesting, burrowing or roosting sites.

36-5 BLM rates the habitat as low to moderate value for wildlife.

36-6 Please refer to General Response No. 6 - Mining Claims. BLM rates the project area as Resource Category IV, defined as habitat which exhibits low wildlife productivity as a result of man's influence.

36-7 The reclamation bond will not be released until AZCO reclaims the project site as stipulated in the Record of Decision.

Letter 36 continued

Mr. Larry Thrasher 3 May 18, 1992

acre. This will require a pre-disturbance measurement of the native vegetation biomass on the land.

36-8 It is likely that some irrigation will be required for a period to establish native plant species, and we believe that BLM should require that AZCO provide irrigation if required. Also, it may be necessary to defer livestock grazing for one or more growing seasons on revegetated lands.

36-9 Additionally, we are concerned about whether the reclamation bond is sufficient to insure that reclamation will be completed. We understand that BLM bonding policy for mining activity calls for bonds to be set at estimated costs not to exceed $2,000 per acre. Based on disturbance of 1400 acres, this operation could require a bond of $2,800,000. However, AZCO has estimated their reclamation costs and bonding requirements at only $664,411 We believe that BLM should insure that the bond is large enough that BLM could complete the required reclamation in case AZCO was unable to complete mitigation and forfeited the bond.

36-10 We are pleased that the reclamation and closure plan calls for revegetation with native plants, and we emphasize that only <u>native</u> plants should be used in any revegetation effort. Additionally, we are pleased to see that coversoil will be salvaged and stored for use in reclamation. However, we note that stockpiles of coversoil will be seeded with perennial grass to prevent wind and water erosion. We caution that only <u>native</u> perennial grass species should be used for this erosion control; if nonnative grasses are used, that soil will contain a seedbank of nonnative grasses that will be impossible to override when that same soil is used for native plant establishment.

<u>Solution Ponds</u>:

36-11 We are concerned about the ponds that will collect the sulfuric acid solution loaded with dissolved copper. Because the operation is close to the Gila River, considerable numbers of waterfowl and other migratory birds fly by the area and will attempt to land on any ponds that appear to contain water. Therefore, these ponds should be covered with nets or some other positive barrier to prohibit waterfowl and other migratory birds from landing. Studies on other ponds containing mine byproducts have demonstrated that human disturbances are not sufficient to discourage birds from landing.

<u>Access</u>:

36-12 Several options for access are discussed in the EIS. Use of the existing road (Sanchez Road) would cause less loss of wildlife habitat. Of the two alternate routes (Option 1 and 2), the more

Response to Letter 36

36-8 BLM will evaluate the success of irrigation in the test plots to reestablish native species. Livestock grazing may be deferred for one or two growing seasons.

36-9 Please refer to General Response No. 3 - Reclamation Bonding. The BLM cannot arbitrarily request a reclamation bond at the maximum rate of $2000 per acre. Instead, all reclamation costs must be itemized based on cost estimates prepared by BLM engineers. The mining company has the right to appeal the amount to the BLM State Director if this procedure is not followed, or if itemized costs seem unreasonable. Please also refer to Appendices A and B for reclamation bond estimates.

36-10 All species used for revegetation and soil stabilization will be native to the area.

36-11 Please refer to General Response No. 7 - Migratory Bird Netting.

36-12 Please refer to General Response No. 1 - Access Route.

Mr. Larry Thrasher 4 May 18, 1992

northerly road (Option 2) would cause destruction of more valuable wildlife habitat, because higher biomass of vegetation at this site correlates to higher densities of wildlife species. However, none of the access options are in critical high-quality wildlife habitat, and other public concerns may be more significant in the selection of an access route.

Loss of Bat Habitat:
36-13 As you know, two mine adits were closed on January 28, 1992, in preparation for their destruction by this mining operation. At that time, a significant winter population of over 300 Macrotus californicus (California leaf-nosed bat) was chased from one adit. Macrotus californicus is a Category 2 candidate for listing by the U.S. Fish and Wildlife Service under the Endangered Species Act, and is a candidate for Arizona state listing. Although both the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department concurred with the closing of the mine adits in winter in preparation for their destruction in spring or summer, the discovery of more than 300 Macrotus in the adit significantly increases the importance of that act. Although Macrotus are known to use alternate winter roostsites, we do not know of alternate winter roostsites in the area. If no appropriate roostsites exist with suitable temperature, humidity, and protection from predators and human activity, it is possible that this act significantly impacted Macrotus species in Arizona. Not many winter roostsites are known for Macrotus.

36-14 Because of the significance of this adit closure, we believe that $2,500 for bat research is inadequate mitigation for the lost bat habitat. We believe that the goal of this research should be to locate an alternate Macrotus winter roostsite nearby, and that AZCO should be required to protect that roostsite, both by insuring that the alternate site is in public ownership and by providing some protective gating measures.

Grazing:
36-15 Because vegetation will be removed from 1407 acres of federal land in two allotments, authorized livestock numbers on those allotments should be reassessed to insure that adjacent lands are not overgrazed. Any decreases in authorized livestock numbers should be included in the expected impacts of this project.

We appreciate the opportunity to review and comment on this project. If we can provide any additional information, please contact Rick Gerhart or me at 628-5376.

36-13 BLM consulted with both the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department before this implementing this action. All three agencies agreed on this action and the appropriate time of year (winter) to commence the closure efforts.

36-14 BLM and AZCO agreed to the $2,500 amount for bat research as compensation for closure of the man-made adits. Perhaps the Arizona Game and Fish Department and the U.S. Fish and Wildlife Service would be willing to participate in a cost-share project with the BLM to study and mitigate this unexpected development.

36-15 BLM will cancel a portion of the Sanchez Grazing Allotment. The allotment preference is for 14 cows year-round.

Mr. Larry Thrasher 5 May 18, 1992

Sincerely,

Joan E. Scott

Joan E. Scott
Habitat Specialist
Tucson Regional Office

JES

cc: Gerald I Perry, Region V Supervisor
Richard A. Gerhart, Region V Habitat Program Manager
Mike Holloran, District Wildlife Manager
David L. Walker, Habitat Evaluation Coordinator
[3-13-92(16)]
Sam Spiller, Field Supervisor, USFWS, Phoenix ES Office
Jeanne Geselbracht (E-3), EPA, Region IX, 75 Hawthorne St., San Francisco 94105
Don Spencer, Plans Review & Permits, ADEQ, P.O. Box 600, Phoenix 85001

ARIZONA GAME AND FISH DEPARTMENT OPERATING MANUAL	No.	I2.3
	Effective	04-01-91
	Page	1 of 5
Habitat and Environment	Approved:	

Wildlife and Wildlife Habitat Compensation

Department Policy

It shall be the policy of the Department to develop adequate compensation plans for actual or potential habitat losses resulting from land and water projects in accordance with State and Federal laws. Habitat compensation plans will be predicated upon a 100% level of compensation and will be developed using habitat resource category designations. See Commission Policy A2.16.

Authority

The Director of the Arizona Game and Fish Department is authorized under A.R.S. Title 17-211, Subsection D, to perform the necessary administrative tasks required to manage the wildlife resources of the State of Arizona. Pursuant to those duties and in accordance with federal environmental laws and resource management acts, such as the National Environmental Policy Act, Fish and Wildlife Coordination Act, and Endangered Species Act, the Director is further charged with cooperating in the determination of potential impacts to Arizona's wildlife resources resulting from federally funded land and water projects. In addition, a Commission M.O.U. assigns similar responsibilities for evaluating proposed projects on lands administered by the State Land Department. An integral part of this process is the development of adequate compensation measures aimed at eliminating or reducing project-associated impacts.

Procedure

Criteria used to identify general compensation goals are as follows:

A. Resource Category I.

1. Designation Criteria:

   Habitat in this category are of the highest value to Arizona wildlife species, and are unique and/or irreplaceable on a statewide or ecoregion basis.

2. Compensation Goal:

   No loss of existing in-kind habitat value.

ARIZONA GAME AND FISH DEPARTMENT		No.	I2.3
OPERATING MANUAL		Effective	04-01-91
		Page	2 of 5
Habitat and Environment		Approved:	

Wildlife and Wildlife Habitat Compensation

3. Guideline:

The Department will recommend that all potential losses of existing habitat values be prevented. Insignificant changes that would not result in adverse impacts to habitat values may be acceptable provided they will have no significant cumulative impact.

4. Habitat Types:

Habitat types associated with Resource Category I shall include, but not limited to the following examples:

a. Perennial Stream Habitats.

b. Westlands and Riparian habitats of at least one acre in size which are associated with perennial waters. Biotic communities included in this classification follow descriptions provided in Brown (1982) and Henderson and Minckley (1984).

c. Key utilization areas for species listed or proposed for listing under the Endangered Species Act of 1973 as Threatened or Endangered and Endangered State Threatened Native Wildlife species.

B. <u>Resource Category II.</u>

1. Designation Criteria:

Habitats in this category are of high value for Arizona wildlife species and are relatively scarce or becoming scarce on a statewide or ecoregion basis.

2. Compensation Goal:

No net loss of existing habitat value, while minimizing loss of in-kind value.

ARIZONA GAME AND FISH DEPARTMENT OPERATING MANUAL	No.	I2.3
	Effective	04-01-91
	Page	3 of 5
Habitat and Environment	Approved:	

Wildlife and Wildlife Habitat Compensation

3. Guideline:

The Department will recommend that all potential losses of Resource Category II habitat values be avoided or minimized. If significant losses are likely to occur, the Department will recommend alternatives to immediately rectify, reduce, or eliminate these losses over time.

4. Habitat Types:

Habitat types associated with Resource Category II shall include, but not limited to, the following examples:

a. Key utilization areas for antelope and bighorn sheep.

b. Key utilization areas for Threatened and Candidate State Threatened Native Wildlife species, candidate species for federal listing as Threatened or Endangered (Categories 1 and 2).

c. Actual or potential reintroduction sites for species that are listed as Extirpated or Endangered on the State Threatened Native Wildlife list.

d. Blue ribbon fishing areas (i.e., Lee's Ferry and Becker Lake).

e. Isolated mountain ranges providing Subalpine-coniferous forest habitats (i.e., Pinaleno Mountains).

f. State and federally operated game preserves, refuges or wildlife areas.

g. Montane meadows.

C. Resource Category III.

1. Designation Criteria:

Habitats in this category are of high to medium value for Arizona wildlife species, and are relatively abundant on a statewide basis.

ARIZONA GAME AND FISH DEPARTMENT		No.	I2.3
OPERATING MANUAL		Effective	04-01-91
		Page	4 of 5
Habitat and Environment		Approved:	

Wildlife and Wildlife Habitat Compensation

2. Mitigation Goal:

No net loss of habitat value.

3. Guidelines:

The Department will recommend ways to minimize or avoid habitat losses. Anticipated losses will be compensated by replacement of habitat values in-kind, or by substitution of high value habitat types, or by increased management of replacement habitats, so that no net loss occurs.

4. Habitat Types Involved:

Habitats in this category are of a natural, undisturbed condition or they involve bodies of water of economic importance and shall include, but not be limited to, the following examples:

a. Chihuahua, Great Basin, Mohave, and Sonoran Desert habitat types.

b. Desert-grasslands and Chaparral zones.

c. Oak and coniferous woodlands and coniferous forests.

d. Reservoir habitats.

D. Resource Category IV.

1. Designation Criteria:

Habitats in this category are of medium to low value for Arizona wildlife species, due to proximity to urban developments or low productivity associated with these lands.

2. Mitigation Goal:

Minimize loss of habitat value.

Wildlife and Wildlife Habitat Compensation

3. Guideline:

The Department will recommend ways to avoid or minimize habitat losses. Should losses be unavoidable, the Department may make a recommendation for compensation, based on the significance of the loss.

4. Habitat Types Involved:

Habitat types associated with Resource Category IV shall include, but not be limited to, the following examples:

a. Agricultural Lands.

b. Undeveloped urban areas (i.e., land proximal to waste water treatment facilities, municipal mountain preserves, and undeveloped lands in proximity to municipal and industrial areas).

c. Habitats exhibiting low wildlife productivity as a result of man's influence.

Letter 37

TUCSON AUDUBON SOCIETY

Audubon Nature Shop
300 E. University #120
Tucson, Arizona 85705
602/629/0510

Larry Thrasher
BLM Project Manager
Safford District BLM
425 East 4th Street
Safford, Arizona 85546

Dear Mr. Thrasher:

Re: AZCO's Proposed Sanchez Mine

37-1 Tucson Audubon concurs in the extensive remarks made to you in the April 14th letter from Dr. R.R.Schmoller. AZCO's proposed operation near the Gila Box has a potentially devastating environmental effect on the Gila "eco-isthmus" as described by Schmoller. It is imperative that the BLM take his points into consideration in the location and operation of the mine.

I request any details on your response to Dr. Schmoller's points. Tucson Audubon remains interested in this issue.

Sincerely,

David Yetman

conservation
education
recreation

Response to Letter 37

37-1 Please refer to the response to Dr. R. R. Schmoller's letter (number 15).

Letter 38

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

FIFE SYMINGTON, GOVERNOR
EDWARD Z. FOX, DIRECTOR

WQMS-301.210
WQMS-389.025
HUC-1504005

June 9, 1992

Larry Thrasher
BLM Project Manager
Safford District Office
425 East 4th Street
Safford, Arizona 85546

RE: Draft Environmental Impacts Statement, Sanchez Copper Project

Dear Mr. Thrasher:

The Water Assessment Section has reviewed the referenced document published by the BLM, dated March 1992. It has been reviewed from both the point and nonpoint source perspectives for potential impacts to surface water quality.

38-1 The proposal provides useful information which identifies potential impacts to surface water quality, and features that should be capable of minimizing impacts. However, given the magnitude of the proposed project and its proximity to the Gila River, the Department would like to address some additional concerns regarding possible water quality degradation.

Data from the U.S. Geological Survey sampling site near Solomon indicate that the Gila River is in partial attainment of its protected uses, with elevated turbidity/suspended sediment levels occasionally exceeding state standards. It is therefore critical to prevent additional sediment from entering the Gila River channel. The draft EIS acknowledges the potential for increased turbidity/sediment loading to surface waters from stormwater runoff, primarily from sediment-enriched runoff draining the waste rock dump located to the east of the open pit. The draft EIS also indicates that a sediment pond will be constructed below the waste rock dump to intercept the runoff and provide a settling basin for the sediment. The report should also consider the possibility of leachate produced by mineralized overburden that is displaced by the construction.

38-2 The mine waste dump, heap leach pads and other facilities are expected to fill several acres of watercourses. A Federal Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (Corps) is required, prior to the placement of this fill. A review of the alternatives analysis and mitigation plan for impacted waters of the United States will be performed as a part of the Corps permitting process. State 401 Water Quality Certification is also required from the Arizona Department of Environmental Quality

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Response to Letter 38

38-1 The analysis in Appendix C - Report on Waste Material Testing indicates that there will not be excessive metals leaching from materials exposed during construction. Also, 23 million tons of low-grade mineralized material (overburden) will be stacked on the heap leach pad for processing.

38-2 Thank you for your comment. BLM and AZCO have given consideration to the other federal, state and local permits required for construction and operation of the Sanchez Copper Project.

Letter 38 continued

Mr. Larry Thrasher
June 9, 1992
Page 2

(ADEQ) for this permit. Other environmental protection permits for air pollution control, aquifer protection and NPDES (CWA Section 402) may also be required.

38-3 Two small watercourses will be intercepted by the open pit. The intermittent flow from these watercourses may be captured for process water and used in the mining operation. If these waters are allowed to pass through the disturbed area, they must not be degraded to the point of violating Water Quality Standards for Navigable Waters, A.A.C. R18-11-1. Determination of water rights must be made by the Arizona Department of Water Resources.

38-4 The leach pad will also intercept storm water flows from the mountains north of this mining operation. The priority here is to bypass these flows into Head Canyon, just south of the leach pads. Head Canyon is a major feature of the landscape in this area. If the normal storm water is directed into another drainage, the riparian growth in Head Canyon would degrade. Animal life in Head Canyon would also be negatively impacted. Detailed analyses of pollution discharges from the stormwater routing and sediment pond systems will be performed in connection with the CWA permit reviews that are performed by ADEQ.

Thank you for providing us the opportunity to comment on this proposed project and advising us of the extended comment date. If you have any questions on these comments, please contact Edwin Swanson at (602) 207-4501.

Sincerely,

F. Woodwick
Forrest Woodwick
Acting Manager
Water Assessment Section

JRM/afh

cc: Robert Dummer, COE
Joe Gibbs,
Roger Kennett
Don Shroyer
Edwin Swanson
Eric Swanson, AGFD
Arizona State Clearinghouse (SAI 92-80-0012)
Arizona Department of Water Resources, Water Rights

A JM 92/disc mining

Response to Letter 38

38-3 A diversion ditch will capture runoff from these two small watercourses and route it around the open pit. The Arizona Department of Water Resources is responsible for determination of water rights.

38-4 A diversion ditch on the north side of the leach pad will intercept runoff and channel it to its original drainage in Head Canyon. Detailed analyses of surface water discharges from stormwater routing and sediment pond systems will be performed in connection with the Clean Water Act permit reviews which are performed by Arizona DEQ.

Letter 39

UNITED STATES GOVERNMENT

memorandum

Office of the Superintendent
(602) 475-2322

DATE: AUG 20 1992

REPLY TO ATTN OF: Superintendent, San Carlos Agency

SUBJECT: AZCO Mine Proposal

TO: Bureau of Land Management
Attention: Safford District Manager

It was good to meet you at the San Carlos Council meeting on August 19 and I would like to welcome you to Arizona. As members of the Department of the Interior "team", the Bureau of Indian Affairs (BIA) and Bureau of Land Management (BLM) must strive to represent the trust responsibility the United States has to Indian tribal governments. I am confident that you and I, as the local line officers of our respective organizations, can forge a working relationship to better serve our customers.

39-1 As we discussed at the August 19, Council meeting, we are concerned that the proposed AZCO copper mine may directly or indirectly impact the quantity and quality of the water in the Gila River. As explained in the meeting the southern rim of the open pit will be approximately one-fourth mile north of the Gila River, and the bottom of the pit will be dug to a depth that will be well below the present elevation of the river. While we understand the plans call for safeguards and contingencies to ensure the integrity of the Gila River will be maintained, as trustee to the San Carlos Apache Tribe, the Department of the Interior as represented by the BLM and BIA must be absolutely certain before this project can be supported.

As committed in the above mentioned meeting, we look forward to reviewing the final EIS which will now include a discussion about the water quantity and quality issues of concern to the BIA and the Tribe.

Again, welcome to Arizona and feel free to call if you have any questions on this or any other matter.

Allen J. Anspach

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OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114
★ U.S. GPO 1986—491-248/40042

Response to Letter 39

39-1 The Final EIS contains revised Sections 3.3 and 4.3 which update the hydrologic information, impacts and mitigation. AZCO contracted with GSi/water to perform additional hydrologic field studies during 1992 (GSi/water, September 1992). These data have been included in the Final EIS.

Calculations by GSi/water indicate that during pit development, inflow to the pit from the Upper Gila Conglomerate aquifer (which is separate from the Upper Gila aquifer in the younger sediments along the Gila River) could be up to 170 gpm. Inflow from the Bedrock aquifer (fractured bedrock) could be up to 250 gpm. Both of these flows are expected to decrease to very low values once initial dewatering has occurred. These flows also would not occur concurrently, since as the pit is developed, the Upper Gila Conglomerate aquifer would be dewatered long before the full inflow potential of the Bedrock aquifer has been developed. The anticipated post-closure inflow is 9 to 250 gpm, primarily from the Bedrock aquifer. The source of recharge for the Bedrock aquifer is believed to be the Gila Mountains. GSi/water has concluded that there will be no measurable effect on the Upper Gila aquifer (or the Gila River) from pit inflows.

Index

Index (Continued)

References

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APPENDIX A

U.S. BUREAU OF LAND MANAGEMENT SURETY BOND ESTIMATE

Appendix A
Surety Bond Estimate
Total Project

1.0 DECOMMISSIONING

1.1 HEAP LEACH NEUTRALIZATION

1.1.1 Assumptions

- Rinsing heap with fresh water 5 days for 8 hours continuously will meet state standards.
- Estimated 720 hours required to neutralize; based on 90, 8-hour days.
- Existing piping will be utilized during rinsing process.
- Crew will consist of 2 laborers on-site for 8 hours per day, 5 days per week.

1.1.2 Work Time 2 laborers x 720 hours = 1,440 hours

1.1.3 Work Cost 1,440 hours x $25.01 = $ 36,014

1.2 EQUIPMENT REMOVAL

1.2.1 Assumptions

- Equipment and piping will be removed and disposed of off-site by a contractor during building and plant site removal.
- All heavy mine equipment will either be leased or owned by the mining company and, hence, will be removed by the lessor or mining company.

1.2.2 Work Time 2 laborers x 40 hours per week = 80 hours

1.2.3 Work Cost 80 hours x $25.01 = 2,001

1.3 PLANT AND BUILDING REMOVAL

1.3.1 Assumptions

- Salvage value of buildings will offset removal cost.

1.3.2 Work Time n/a

1.3.3 Work Cost n/a 0

1.4 SOLUTION POND NEUTRALIZATION

1.4.1 Assumptions

- Ponds evaporated to one million gallons containing 3 grams/liter sulfuric acid (.025 pounds/gallon). Neutralize with 0.57 pounds lime per pound sulfuric acid, or 7.5 tons of lime.

1.4.2 Work Time

2 laborers x 8 hours = 16 hours

1.4.3 Work Cost

16 hours x $25.01/hour = 400

1.4.4 Materials Cost

7.5 tons lime x $100/ton = 750

TOTAL DECOMMISSIONING COST $ 39,165

2.0 BACKFILLING & FINAL GRADING

2.1 ASSUMPTIONS

- Approximately 96,800 cubic yards of material will be backfilled into 20 acres of ponds.
- Approximately 17 acres of roads will require ripping.
- Approximately 20 acres of office/plant sites and 17 acres of roads will require final grading.
- The waste dump and heap leach sites will not require grading or ripping following cessation of operations.

2.2 BACKFILLING OF PONDS

2.2.1 Equipment and Production Rate for Backfilling of Ponds

- Use D9N bulldozer ($117.03/hour)
- Average dozer push of 750 feet
- D9N bulldozer production rate = 350 LCY per hour. Corrected production rate = 314 LCY per hour.

2.2.2 Work Time

96,800 CY ÷ 314 LCY per hour = 308 hours

2.2.3 Work Cost

308 hours x $117.03/hour = $ 36,045

2.3 RIPPING OF ROADS

2.3.1 Equipment and Production Rate

- Use D9N bulldozer ($117.03/hour)
- Can rip 1.5 acres per hour

2.3.2 Work Time

17 acres ÷ 1.5 acres/hour = 11.5 hours

2.3.3 Work Cost

11.5 hours x $117.03/hour = 1,346

2.4 GRADING OF OFFICE/PLANT SITES AND ROADS

2.4.1 Equipment & Production Rate

- Use D9N bulldozer ($117.03/hour)
- Can grade 1.5 acres per hour

2.4.2 Work Time

37 acres ÷ 1.5 acres per hour = 25 hours

2.4.3 Work Cost

25 hours x $117.03/hour = 2,926

TOTAL BACKFILLING, RIPPING & GRADING COST $ 40,317

3.0 COVER SOIL REPLACEMENT

3.1 ASSUMPTIONS

- Apply cover soil to 765 acres of generally flat terrain.
- Volume of soil to apply = 462,825 CY for an average soil depth of 4.5 inches.

3.2 LOAD COVER SOIL

3.2.1 Equipment and Production Rate

- Use 988B front-end loader ($96.89 per hour) with a 7 CY bucket.
- .49 minutes per cycle.
- 60 minutes x .49 minutes/cycle = 122 cycles/hour potential
- 122 cycles/hour x .83 (average efficiency) = 101 cycles/hour actual.

3.2.2 Work Time

462,825 CY ÷ 707 CY/hour = 655 hours

3.2.3 Work Cost

655 hours x $96.89/hour = 63,463

3.3 HAUL COVERSOIL TO HEAP LEACH PADS, WASTE DUMP, OTHER DISTURBANCES

3.3.1 Equipment and Production Rate

- 40-Ton haul truck capacity.
- Haul truck travels 1/2 mile round trip, making 3.6 loads/hour.
- Cover soil weight range: 2,600 to 3,400 lbs./LCY
- Average weight of stockpiled growth mediums = 3,000 lbs./LCY
- Tons of cover soil required = 462,825 CY x 1.5 tons/CY = 694,238 tons.
- Number of loads to haul = 694,238 tons ÷ 40 tons/load = 17,356.

3.3.2 Work Time

17,356 loads ÷ 3.6 loads/hour = 4,821 hours

3.3.3 Work Cost

4,821 hours x $67.93/hour = 327,497

TOTAL COVER SOIL REPLACEMENT COST $ 390,960

4.0 FERTILIZATION

4.1 ASSUMPTIONS

- Fertilize 765 acres of generally flat terrain.

4.2 EQUIPMENT AND PRODUCTION RATE

- Use JD710 tractor ($81.95 per hour) and drill ($20.00 per hour) = $101.95 per hour.
- Drill rate for 765 acres regular terrain = 2.0 acres per hour

4.3	WORK TIME	765 acres ÷ 2 acres/hour = 383 hours	
4.4	WORK COST	383 hours x $101.95 per hour =	$ 39,047

TOTAL FERTILIZATION COST $ 39,047

5.0 FERTILIZER COST

5.1 ASSUMPTIONS

- 765 acres will be fertilized
- The type and application rate of fertilizer will be determined by soil testing prior to application.
- Assumed 250 pounds per acre of nitrogen fertilizer per acre for purposes of costing.

5.2 FERTILIZER REQUIRED

765 acres x 250 lbs./acre = 191,250 lbs. (96 tons)

5.3	FERTILIZER COST	96 tons x $353.00/ton =	$ 33,888

TOTAL FERTILIZER COST $ 33,888

6.0 SEEDING

6.1 ASSUMPTIONS

- Seed 765 acres of generally flat terrain.

6.2 EQUIPMENT AND PRODUCTION RATE

- Use Rangeland Drill ($81.95 per hour) and JD710 tractor ($20.00 per hour) = $101.95 per hour.
- Seeding rate for 765 acres regular terrain = 1.5 acres per hour.

6.3	**WORK TIME**	765 acres ÷ 1.5 acres per hour = 510 hours	
6.4	**WORK COST**	510 hours x $101.95 per hour =	$ 51,995

TOTAL SEEDING COST $ 51,995

7.0 SEED MIX COST

7.1 ASSUMPTIONS

- 765 acres will be seeded.
- A seed mix composed of native grasses, forbs, shrubs, and trees will be developed from species listed in Table 2-4.
- Plant species selection will be based on seed availability and cost.
- Seeding rate will be 12 lbs. of pure live seed (PLS) per acre.

7.2	**SEED REQUIRED**	765 acres x 12 lbs. per acre = 9,180 lbs.	
7.3	**SEED COST**	9,180 lbs. x $14.00 per pound =	$ 128,520

TOTAL SEED MIX COST $ 128,520

8.0 MULCHING AND CRIMPING

8.1 ASSUMPTIONS

- Mulch and crimp 765 acres of generally flat terrain.

8.2 EQUIPMENT AND PRODUCTION RATE

- Use JD710 tractor ($81.95 per hour) and mulcher ($40.00 per hour) = $121.95 per hour.
- Use JD710 tractor ($81.95 per hour) and disc ($15.00 per hour) for crimping = $96.95 per hour.
- Mulching rate for 765 acres regular terrain = 5.0 acres per hour.
- Crimping rate for 765 acres regular terrain = 3.0 acres per hour.

8.3	**WORK TIME**	Mulching - 765 acres ÷ 5 acres/hour = 153 hours	
		Crimping - 765 acres ÷ 3 acres/hour = 255 hours	
8.4	**WORK COST**	Mulching - 153 hours x $121.95/hour =	$ 18,658
		Crimping - 255 hours x $ 96.95/hour =	24,722
		TOTAL MULCHING AND CRIMPING COST	**$ 43,380**

9.0 MULCH COST

9.1 ASSUMPTIONS

- 765 acres will be straw mulched.
- Applied at rate of 2,000 lbs. (1 ton) per acre.

9.2	**MULCH REQUIRED**	765 acres x 1 ton/acre = 765 tons	
9.3	**MULCH COST**	765 tons x $60.00/ton =	$ 45,900
		TOTAL MULCH COST	**$ 45,900**

10.0 RECLAMATION SUPERVISION

10.1 ASSUMPTIONS

- Many of the reclamation activities will be conducted concurrently, thereby reducing the time required for supervision.

10.2 WORK TIME A reclamation supervisor will be on site a maximum of 300 hours.

10.3 WORK COST 300 hours x $50 per hour = $ 15,000

TOTAL RECLAMATION SUPERVISION COST $ 15,000

11.0 ADMINISTRATION

11.1 ASSUMPTION

- 18% of total reclamation cost subtotal

TOTAL ADMINISTRATION COST $ 149,071

RECAP OF RECLAMATION COSTS FOR SURETY BOND ESTIMATE:

1.	Decommissioning	$ 39,165
2.	Backfilling and Final Grading	40,317
3.	Cover Soil Replacement	390,960
4.	Fertilization	39,047
5.	Fertilizer Cost	33,888
6.	Seeding	51,995
7.	Seed Mix Cost	128,520
8.	Mulching and Crimping	43,380
9.	Mulch Cost	45,900
10.	Reclamation Supervision	15,000
	SUBTOTAL	828,172
11.	Administration	149,071

GRAND TOTAL ALL COSTS $ 977,243

APPENDIX B

U.S. BUREAU OF LAND MANAGEMENT SURETY BOND ESTIMATE FOR THE FIRST THREE YEARS OF OPERATION

Appendix B
Surety Bond Estimate
For the First Three Years of Operation

1.0 DECOMMISSIONING

1.1 HEAP LEACH NEUTRALIZATION

1.1.1 Assumption

- One-third of total project heap leach neutralization cost, as described in detail in Appendix A.

1.1.2 Work Time

2 laborers x 240 hours = 480 hours

1.1.3 Work Cost

480 hours x $25.01 = $ 12,005

1.2 EQUIPMENT REMOVAL

1.2.1 Assumptions

- Equipment and piping will be removed and disposed of off-site by a contractor during building and plant site removal.
- All heavy mine equipment will either be leased or owned by the mining company and, hence, will be removed by the lessor or mining company.

1.2.2 Work Time

2 laborers x 40 hours per week = 80 hours

1.2.3 Work Cost

80 hours x $25.01 = 2,001

1.3 PLANT AND BUILDING REMOVAL

1.3.1 Assumptions

- Salvage value of buildings will offset removal cost.

1.3.2 Work Time

n/a

1.3.3 Work Cost

n/a 0

1.4 SOLUTION POND NEUTRALIZATION

1.4.1 Assumptions

- Ponds evaporated to one million gallons containing 3 grams/liter sulfuric acid (.025 pounds/gallon). Neutralize with 0.57 pounds lime per pound sulfuric acid, or 7.5 tons of lime.

1.4.2 Work Time

2 laborers x 8 hours = 16 hours

1.4.3 Work Cost

16 hours x $25.01/hour = 400

1.4.4 Materials Cost

7.5 tons lime x $100/ton = 750

TOTAL DECOMMISSIONING COST $ 15,156

2.0 BACKFILLING & FINAL GRADING

2.1 ASSUMPTIONS

- Approximately 96,800 cubic yards of material will be backfilled into 20 acres of ponds.
- Approximately 17 acres of roads will require ripping.
- Approximately 20 acres of office/plant sites and 17 acres of roads will require final grading.
- The waste dump and heap leach sites will not require grading or ripping following cessation of operations.

2.2 BACKFILLING OF PONDS

2.2.1 Equipment and Production Rate for Backfilling of Ponds

- Use D9N bulldozer ($117.03/hour)
- Average dozer push of 750 feet
- D9N bulldozer production rate = 350 LCY per hour. Corrected production rate = 314 LCY per hour.

2.2.2 Work Time

96,800 CY ÷ 314 LCY per hour = 308 hours

2.2.3 Work Cost

308 hours x $117.03/hour =	$ 36,045

2.3 RIPPING OF ROADS

2.3.1 Equipment and Production Rate

- Use D9N bulldozer ($117.03/hour)
- Can rip 1.5 acres per hour

2.3.2 Work Time

17 acres ÷ 1.5 acres/hour = 11.5 hours

2.3.3 Work Cost

11.5 hours x $117.03/hour =	1,346

2.4 GRADING OF OFFICE/PLANT SITES AND ROADS

2.4.1 Equipment & Production Rate

- Use D9N bulldozer ($117.03/hour)
- Can grade 1.5 acres per hour

2.4.2 Work Time

37 acres ÷ 1.5 acres per hour = 25 hours

2.4.3 Work Cost

25 hours x $117.03/hour =	2,926

TOTAL BACKFILLING, RIPPING & GRADING COST **$ 40,317**

3.0 COVER SOIL REPLACEMENT

3.1 ASSUMPTIONS

- Apply cover soil to 255 acres of generally flat terrain.
- Volume of soil to apply = 154,275 CY for an average soil depth of 4.5 inches.

3.2 LOAD COVER SOIL

3.2.1 Equipment and Production Rate

- Use 988B front-end loader ($96.89 per hour) with a 7 CY bucket.
- .49 minutes per cycle.
- 60 minutes x .49 minutes/cycle = 122 cycles/hour potential
- 122 cycles/hour x .83 (average efficiency) = 101 cycles/hour actual.

3.2.2 Work Time

154,275 CY ÷ 707 CY/hour = 218 hours

3.2.3 Work Cost

218 hours x $96.89/hour = 21,122

3.3 HAUL COVERSOIL TO HEAP LEACH PADS, WASTE DUMP, OTHER DISTURBANCES

3.3.1 Equipment and Production Rate

- 40-Ton haul truck capacity.
- Haul truck travels 1/2 mile round trip, making 3.6 loads/hour.
- Cover soil weight range: 2,600 to 3,400 lbs./LCY
- Average weight of stockpiled growth mediums = 3,000 lbs./LCY
- Tons of cover soil required = 154,275 CY x 1.5 tons/CY = 231,413 tons.
- Number of loads to haul = 231,413 tons ÷ 40 tons/load = 5,785.

3.3.2 Work Time

5,785 loads ÷ 3.6 loads/hour = 1,607 hours

3.3.3 Work Cost

1,607 hours x $67.93/hour = 109,164

TOTAL COVER SOIL REPLACEMENT COST $ 130,286

4.0 FERTILIZATION

4.1 ASSUMPTIONS

- Fertilize 255 acres of generally flat terrain.

4.2 EQUIPMENT AND PRODUCTION RATE

- Use JD710 tractor ($81.95 per hour) and drill ($20.00 per hour) = $101.95 per hour.
- Drill rate for 255 acres regular terrain = 2.0 acres per hour

4.3	WORK TIME	255 acres ÷ 2 acres/hour = 128 hours	
4.4	WORK COST	128 hours x $101.95 per hour =	$ 13,050

TOTAL FERTILIZATION COST $ 13,050

5.0 FERTILIZER COST

5.1 ASSUMPTIONS

- 255 acres will be fertilized
- The type and application rate of fertilizer will be determined by soil testing prior to application.
- Assumed 250 pounds per acre of nitrogen fertilizer per acre for purposes of costing.

5.2	FERTILIZER REQUIRED	255 acres x 250 lbs./acre = 63,750 lbs. (32 tons)	
5.3	FERTILIZER COST	32 tons x $353.00/ton =	$ 11,296

TOTAL FERTILIZER COST $ 11,296

6.0 SEEDING

6.1 ASSUMPTIONS

- Seed 255 acres of generally flat terrain.

6.2 EQUIPMENT AND PRODUCTION RATE

- Use Rangeland Drill ($81.95 per hour) and JD710 tractor ($20.00 per hour) = $101.95 per hour.
- Seeding rate for 255 acres regular terrain = 1.5 acres per hour.

6.3	**WORK TIME**	255 acres ÷ 1.5 acres per hour = 170 hours	
6.4	**WORK COST**	170 hours x $101.95 per hour =	$ 17,332

TOTAL SEEDING COST $ 17,332

7.0 SEED MIX COST

7.1 ASSUMPTIONS

- 255 acres will be seeded.
- A seed mix composed of native grasses, forbs, shrubs, and trees will be developed from species listed in Table 2-4.
- Plant species selection will be based on seed availability and cost.
- Seeding rate will be 12 lbs. of pure live seed (PLS) per acre.

7.2	**SEED REQUIRED**	255 acres x 12 lbs. per acre = 3,060 lbs.	
7.3	**SEED COST**	3,060 lbs. x $14.00 per pound =	$ 42,840

TOTAL SEED MIX COST $ 42,840

8.0 MULCHING AND CRIMPING

8.1 ASSUMPTIONS

- Mulch and crimp 255 acres of generally flat terrain.

8.2 EQUIPMENT AND PRODUCTION RATE

- Use JD710 tractor ($81.95 per hour) and mulcher ($40.00 per hour) = $121.95 per hour.
- Use JD710 tractor ($81.95 per hour) and disc ($15.00 per hour) for crimping = $96.95 per hour.
- Mulching rate for 255 acres regular terrain = 5.0 acres per hour.
- Crimping rate for 255 acres regular terrain = 3.0 acres per hour.

8.3	**WORK TIME**	Mulching - 255 acres ÷ 5 acres/hour = 51 hours	
		Crimping - 255 acres ÷ 3 acres/hour = 85 hours	
8.4	**WORK COST**	Mulching - 51 hours x $121.95/hour =	$ 6,219
		Crimping - 85 hours x $ 96.95/hour =	8,241
		TOTAL MULCHING AND CRIMPING COST	**$ 14,460**

9.0 MULCH COST

9.1 ASSUMPTIONS

- 255 acres will be straw mulched.
- Applied at rate of 2,000 lbs. (1 ton) per acre.

9.2	**MULCH REQUIRED**	255 acres x 1 ton/acre = 255 tons	
9.3	**MULCH COST**	255 tons x $60.00/ton =	$ 15,300
		TOTAL MULCH COST	**$ 15,300**

10.0 RECLAMATION SUPERVISION

10.1 ASSUMPTIONS

- Many of the reclamation activities will be conducted concurrently, thereby reducing the time required for supervision.

10.2	**WORK TIME**	A reclamation supervisor will be on site a maximum of 100 hours.	
10.3	**WORK COST**	100 hours x $50 per hour =	$ 5,000

TOTAL RECLAMATION SUPERVISION COST $ 5,000

11.0 ADMINISTRATION

11.1 ASSUMPTION

- 18% of total reclamation cost subtotal

TOTAL ADMINISTRATION COST $ 54,907

RECAP OF RECLAMATION COSTS FOR SURETY BOND ESTIMATE:

1.	Decommissioning	$ 15,156
2.	Backfilling and Final Grading	40,317
3.	Cover Soil Replacement	130,286
4.	Fertilization	13,050
5.	Fertilizer Cost	11,296
6.	Seeding	17,332
7.	Seed Mix Cost	42,840
8.	Mulching and Crimping	14,460
9.	Mulch Cost	15,300
10.	Reclamation Supervision	5,000
	SUBTOTAL	305,037
11.	Administration	54,907

GRAND TOTAL ALL COSTS $ 359,944

APPENDIX C

REPORT ON WASTE MATERIAL TESTING

Report on Waste Material Testing
Sanchez Copper Project
May, 1992

Prepared by
Mining & Environmental Consultants, Inc.
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INTRODUCTION

AZCO Mining Inc. is planning to develop the Sanchez Copper Project, which includes an open pit copper mine located on public land approximately 10 miles east-northeast of Safford, Arizona. Incident to mining of the copper ore, AZCO plans to remove some 201 million tons of waste material. This material will be placed in a rock dump on natural surface near the open pit. Some precipitation which falls on the dump or runoff which comes in contact with it may percolate through the dump and enter the groundwater.

The Arizona Department of Environmental Quality (ADEQ) requires testing of mine waste material under the Aquifer Protection Permit program to determine its potential to generate acid or release pollutants. The ADEQ currently has no specific procedure for these tests, but since 1991 has been considering adoption of the procedures used by the State of Nevada.

The purpose of this report is to describe the sampling, sample preparation and testing procedures, and the results of tests conducted on waste material samples from the Sanchez Copper Project.

DISCUSSION

Based on surface geology and geological interpretations from underground workings and drill core, the waste material will consist of four material types: alluvium, basalt, andesite and quartz monzonite porphyry (monzonite). The alluvium consists of relatively recent, near-surface (0 to 250 feet in the pit area) sediment which covers the southern portion of the proposed pit. In the immediate vicinity of the pit, the basalt occurs as a relatively thin (100 feet more or less) capping on the ridges and associated talus. Both the alluvium and the basalt are essentially unmineralized, although the alluvium contains some mineralized sediments derived from exposed portions of the orebody.

Andesite makes up approximately 85% of the orebody, with the remaining 15% being monzonite. The lower-grade (below about 0.1% copper) and unmineralized portions of the orebody will be disposed of as waste. The andesite and monzonite occur from the surface to well below the proposed pit bottom some 1,200 feet below the present surface.

In June, 1989, a suite of samples of waste rock from drill core was obtained by Arizona Consultants & Investments, a predecessor to this firm, and subjected to a 30-day column leach test by Metcon Research Inc. (Metcon). Solution samples were taken every five days and analyzed. The leached

residue was then sampled and subjected to an Extraction Procedure Toxicity (EP Tox) test by Turner Laboratories. This procedure was acceptable to the ADEQ at that time.

The solution analyses detected a tiny amount of arsenic (0.010 mg/L), well below state drinking water limits (0.05 mg/L). Even this low value is overstated, since significant evaporation of solution occurred during the test (distilled water was added at the end of 15 days, but not at the end of the test). The addition of water on day 15 reduced the arsenic assay by about two-thirds. From the data, an arsenic assay of 0.003 to 0.004 mg/L would be expected if the solution had been brought back to its original volume at the end of the test.

Very low levels of arsenic and mercury, 0.005 and 0.0003 mg/L respectively, were detected in the EP Tox test. These values are many times lower than EPA toxicity limits (5.0 and 0.2 mg/L respectively). Sampling details and test results are presented in this appendix.

In November, 1991, it was decided to test a suite of waste material samples using Nevada procedures. The Nevada procedures require that samples of waste material be subjected to two tests:

1) an Acid-Base Accounting Test to determine the acid generating potential, and
2) a Meteoric Waters Mobility Test (MWMT) to identify mobile constituents.

Twelve samples, three each of the four material types, were obtained by this firm. The samples were prepared by Metcon and tested by Core Laboratories of Aurora, Colorado. Several months delay between the collection of the samples and testing was occasioned by our unsuccessful attempts to find a local laboratory willing and able to perform these tests.

It was initially planned to do only the Acid-Base Accounting test, and to rely on the earlier column leach - EP Tox test to identify the leachable constituents. In April, 1992, it was decided to include MWMT testing of the new suite of samples to fully comply with the Nevada procedures.

The Acid-Base Accounting test indicated that all of the materials tested had high acid-neutralizing potential and are non-acid-generating. The MWMT tests indicated that, with the exception of calcium, magnesium, potassium, sodium and iron, the metals analyzed for were either below or at the detection limits. Gross alpha radiation was not detected in three of the four samples, and was very low in the fourth (3.0 pCi/L as compared to safe drinking water standard of 15.0). Sample results are presented in this appendix.

CONCLUSIONS

All samples indicated a low acid-generating potential, a high acid-neutralization potential, and contain essentially no leachable toxic substances. The samples were remarkably consistent in this regard.

Based on the tests performed, the waste materials would be classified as non-hazardous by the EPA and non-acid-generating and non-toxic by the state.

Fred B. Brost, P.E.
May 19, 1992

ARIZONA CONSULTANTS & INVESTMENTS
12416 W. Cherry Hills Drive
Sun City, AZ 85351

SANCHEZ COPPER PROJECT
WASTE SAMPLING

On June 1, 1989, at the request of Mr. Richard C. Moores of AZCO, I contacted Mr. Harold Downey, contract geologist for AZCO, to obtain representative samples of andesite and quartz monzonite porphyry for waste characterization testing. The instructions given to Mr. Downey were to select approximately 200 lbs. of drill core which would be representative of the waste material to be encountered within the orebody. The core was to be approximately 80% andesite and 20% quartz monzonite porphyry, which are the approximate percentages of these rock types in the orebody, and less than 0.1% copper.

The samples selected by Mr. Downey were as follows:

	Hole No.	Depth	Coordinates		% Cu
Andesite	703	240	16376 N	14411 E	0.04
162 lbs.	"	360	"	"	0.02
	704	320	16245 N	14572 E	0.01
	705	330	15885 N	13740 E	0.01
Qtz Monz	414	100	15633 N	14014 E	0.01
42 lbs.	"	530	"	"	0.01
	706	70	16245 N	14280 E	0.03
	"	300	"	"	0.03

The samples were sealed in plastic bags marked with the hole number and depth (approximate center of sample interval). The samples were picked up at the AZCO core shed in Solomon and delivered to Metcon Research, Inc. in Tucson by myself.

Registered Professional Engineer
CERTIFICATE NO.
11360
FRED B.
BROST
Date Signed 6/14/89
ARIZONA, U.S.A.

Fred B. Brost, P.E.
June 14, 1989

METCON Research Inc.

1844 W. Grant Road, Suite 106
Tucson, Arizona 85745

Tel: (602) 623-132
Telex 284623 KDE U

4 October 1989
EI-056R-89

Arizona Consultants and Investments
12416 W. Cherry Hills Dr.
Sun City, AZ 85351

Attention: Mr. Fred B. Brost

Subject: Sanchez Project Leaching Tests on Dump Material

Dear Mr. Brost:

1.0 INTRODUCTION

During the second week in June 1989, a suite of samples from the Sanchez Project was delivered to Metcon Research by Mr. Fred B. Brost. A column leach test on dump material was conducted for 30 days. The procedures employed and the results obtained during this study are outlined herein.

2.0 SUMMARY

A column leach test was conducted to study the potential leaching action of rain upon the dump material. The results from this study indicate that the dump material sample tested contained water soluble arsenic minerals, minute amounts of arsenic were detected in the effluent solutions obtained from the column. The arsenic concentration ranged from 0.002 to 0.010 milligrams per liter, the increase in concentration observed was partly due to evaporation losses during testing. The concentration of Cu, Ag, Hg and Cd in solution were all <0.001 milligrams per liter throughout the entire leach period.

3.0 METALLURGICAL PROCEDURES

The procedures utilized for leaching tests are described below.

3.1 Column Leach Test

A composite sample with a total weight of 60 pounds was prepared from a suite of minus 2 inch core samples submitted for testing.

3.1.1 The dump material composite sample was blended by the cone and quartering method. This sample was then placed in a 3 ft by 6 inch ID column.

3.1.2 The dump material was leached by recirculating distilled water through the column for 30 days at a specific flow rate of 0.040 GPM per sq. ft for 30 days. A total of 3 liters of water were used initially. At the end of 15 days, it was necessary to add water up to 3 liters due to evaporation losses.

3.1.3 During this 30 day period, 50 ml samples were drawn on a daily basis from the column and the same amount of distilled water was added as make-up.

3.1.4 At the end of 30 days, the leach solution was completely drained from the column. The residue was then unloaded and a representative sample from the residue was prepared for assay.

4.0 RESULTS AND DISCUSSION

The results obtained during this investigation and a brief discussion are outlined in the following paragraphs.

4.1 Column Leach Test

After the 30 day continuous water leach test on the dump material, a representative sample was taken from the residue and an EP TOX test was conducted on the residue. Analyses from solution samples at 5 day intervals and the EP TOX test results are presented in Tables 4.1 and 4.2 below.

TABLE 4.1 EP TOX TEST RESULTS

DUMP MATERIAL (LEACHED RESIDUE)

Element	Assays (mg/liter)
Arsenic	0.005
Barium	<0.05
Cadmium	<0.05
Chromium	<0.05
Lead	<0.20
Mercury	0.0003
Selenium	<0.001
Silver	<0.02

TABLE 4.2 SANCHEZ PROJECT

DUMP MATERIAL LEACH TEST

Leach Day	Flow rate (GPM/Sq. Ft.)	Solution Assays (mg/liter) Cu	As	Ag	Hg	Cd
1	0.040	<0.001	0.002	<0.001	<0.001	<0.001
2	0.040					
3	0.040					
4	0.040					
5	0.040	<0.001	0.005	<0.001	<0.001	<0.001
6	0.040					
7	0.040					
8	0.040					
9	0.040					
10	0.040	<0.001	0.008	<0.001	<0.001	<0.001
11	0.040					
12	0.040					
13	0.040					
14	0.040					
15	0.040	<0.001	0.003	<0.001	<0.001	<0.001
16	0.040					
17	0.040					
18	0.040					
19	0.040					
20	0.040	<0.001	0.003	<0.001	<0.001	<0.001
21	0.040					
22	0.040					
23	0.040					
24	0.040					
25	0.040	<0.001	0.007	<0.001	<0.001	<0.001
26	0.040					
27	0.040					
28	0.040					
29	0.040					
30	0.040	<0.001	0.010	<0.001	<0.001	<0.001

Inspection of tabulated data indicates that Arsenic was the only element detected in the solutions obtained from the column leach test. The EP TOX test results show an arsenic content of 0.005 mg/liter in the leached residue, mercury was also detected in the residue but there was no indication of the presence of mercury or any other metals in solution throughout the leach period.

We appreciate the opportunity to work with you on this important project. Should you have any questions in regards to this report, please contact us at any of our phone numbers.

Very truly yours,

Eugenio Iasillo

Eugenio Iasillo
Process Engineer

EI:rs

TURNER
LABORATORIES

MR. JOHN LEE
METCON RESEARCH
1844 W. GRANT RD. #106
TUCSON, ARIZONA 85745

REPORT NUMBER: 12653
DATE RECEIVED: 7/26/89
DATE REPORTED: 8/9/89

#344 7/26/89. EP TOX RESULTS.

PARAMETER	RESULT
ARSENIC	0.005
BARIUM	< 0.05
CADMIUM	< 0.05
CHROMIUM	< 0.05
LEAD	< 0.20
MERCURY	0.0003
SELENIUM	<0.001
SILVER	< 0.02

ALL DATA REPORTED IN MILLIGRAMS PER LITER.

W W Turner
W. W. TURNER

1881 W. PRINCE ROAD ■ TUCSON, ARIZONA 85705 ■ 602 293-3406 ■ FAX# 602 888-7519

METCON Research Inc.

1844 W. Grant Road, Suite 106
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Tel: (602) 623-1327
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3 November 1989
EI-078-89

Arizona Consultants and Investments
12416 W. Cherry Hills Dr.
Sun City, AZ 85351

Attention: Mr. Fred Brost

Subject: Solution pH Readings from Test Work Conducted on Sanchez Project

Dear Fred:

Enclosed please find the pH data gathered during the test program conducted on the Sanchez Project samples. Should you need any further information, please do not hesitate to contact us.

Very truly yours,

Eugenio Iasillo

Eugenio Iasillo
Process Engineer

EI:rs

SANCHEZ PROJECT pH READINGS

Test	Day	pH
Dump Material	2	7.7
	3	7.6
	4	7.6
	6	7.7
	7	7.6
	8	7.5
	9	7.7
	11	7.5
	12	7.8
	13	7.8
	14	7.6
	16	7.7
	17	7.7
	18	7.6
	19	7.6
	21	7.6
	22	7.6
	23	7.6
	24	7.6
	26	7.6
	27	7.6
	28	7.6
	29	7.6
Clay Test (Acid)	hrs 11-20	6.1
	21-36	4.9
	37	6.8

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CORE LABORATORIES

CORE LABORATORIES
A N A L Y T I C A L   R E P O R T

Job Number: 920626
Prepared For:

MINING & ENV. CONSULTANTS, INC.
FRED BROST
2338 W. ROYAL PALM, SUITE E
PHOENIX, AZ 85021

Date: 05/13/92

David McWharter 5/13/92
Signature Date:

Name: David A. McWharter

Title: LABORATORY MANAGER

Core Laboratories
1300 South Potomac, Suite 130
Aurora, CO 80012

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CORE LABORATORIES

METEORIC WATER MOBILITY PROCEDURE

MINING & ENV. CONSULTANTS, INC.

05/13/92

The Meteoric Water Mobility Procedure was performed on the andesite, monzonite, alluvium and basal samples. 2.5 kilograms of material with a particle size less than or equal to 5 centimeters was submitted for each sample. The lixiviant consisted of deionized water with the pH adjusted to approximately 5.5. Vessels were filled with a 2:1 liquid to solid ratio and rotated end over end for 24 hours, continuously wetting the sample. The leachates generated from these samples were analyzed for parameters as requested. A summary of data generated from each test is listed below. Results from analysis of leachates are listed in the analytical report.

CLIENT SAMPLE ID	LAB ID	SAMPLE WT. (gms)	LIXIVIANT QTY. (mls)	INITIAL pH	FINAL pH
ANDESITE	920626-1	1500.0	3000.0	5.50	9.43
MONZONITE	920626-2	1500.0	3000.0	5.50	9.93
ALLUVIUM	920626-3	1500.0	3000.0	5.50	9.57
BASAL	920626-4	1500.0	3000.0	5.50	9.37

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L A B O R A T O R Y   T E S T S   R E S U L T S
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: ANDESITE MWMP LEACHATE

LABORATORY I.D...: 920626-0005
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Alkalinity, Total (Filt.)	21	5	mg/L CaCO3	310.1 (1)	04/24/92	MRC
Chloride (Filt.)	5.1	0.5	mg/L	325.2 (1)	04/22/92	DTJ
Conductivity (Filt.)	159	1	umhos/cm @25dC	120.1 (1)	04/24/92	MW
Fluoride (Filt.)	0.9	0.1	mg/L	340.3 (1)	04/23/92	DTJ
Hardness, Total (Filt.)	5	1	mg/L CaCO3	314A (3)	04/16/92	TLK
Nitrogen, Total Kjeldahl (Filt.)	1	1	mg/L (as N)	351.3 (1)	04/20/92	RMN
Nitrogen, Nitrate (Filt.)	0.8	0.1	mg/L (as N)	353.2 (1)	04/22/92	MW
Nitrogen, Nitrite (Filt.)	<0.01	0.01	mg/L (as N)	353.2 (1)	04/22/92	MW
pH (Filt.)	8.97	0.01	pH Units	150.1 (1)	04/24/92	MRC
Solids, Total Dissolved (TDS)	110	10	mg/L	160.1 (1)	04/15/92	RMN
Sulfate (Filt.)	35	10	mg/L	300.1 (1)	04/27/92	PJM
Antimony, Diss. (Sb)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Arsenic, Diss. (As)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Barium, Diss. (Ba)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Cadmium, Diss. (Cd)	<0.005	0.005	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Calcium, Diss. (Ca)	1.3	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Chromium, Diss. (Cr)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Copper, Diss. (Cu)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Iron, Diss. (Fe)	0.22	0.03	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Lead, Diss. (Pb)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Mercury, Diss. (Hg)	<0.0003	0.0003	mg/L	245.1 (1)	04/16/92	WGL
Magnesium, Diss. (Mg)	0.4	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Manganese, Diss. (Mn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK

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CORE LABORATORIES

LABORATORY TESTS RESULTS
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: ANDESITE MWMP LEACHATE

LABORATORY I.D...: 920626-0005
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Nickel, Diss. (Ni)	<0.04	0.04	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Potassium, Diss. (K)	3.9	0.01	mg/L	258.1 (1)	04/16/92	TLK
Selenium, Diss. (Se)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Silver, Diss. (Ag)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Sodium, Diss. (Na)	27	1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Uranium, Diss. (U)	0.001	0.001	mg/L	908.1 (1)	04/29/92	CA
Zinc, Diss. (Zn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Gross Alpha, dissolved	ND		pCi/l	EPA 900.0	05/01/92	CA
Gross Alpha, diss., error, +/-	1.4		pCi/l		05/01/92	CA
Gross Alpha, diss., LLD	2.5		pCi/l		05/01/92	CA
Radium 226, dissolved	0.5		pCi/l	EPA 903.1	05/13/92	CA
Radium 226, diss., error, +/-	0.4		pCi/l		05/13/92	CA
Radium 226, diss., LLD	0.5		pCi/l		05/13/92	CA
Radium 228, dissolved	ND		pCi/l	EPA 904.0	05/12/92	CA
Radium 228, diss., error, +/-	2.1		pCi/l		05/12/92	CA
Radium 228, diss., LLD	3.6		pCi/l		05/12/92	CA

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L A B O R A T O R Y   T E S T S   R E S U L T S
05/13/92

JOB NUMBER: 920626   CUSTOMER: MINING & ENV. CONSULTANTS, INC.   ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: MONZONITE MWMP LEACHATE

LABORATORY I.D...: 920626-0006
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Alkalinity, Total (Filt.)	51	5	mg/L CaCO3	310.1 (1)	04/24/92	MRC
Chloride (Filt.)	4.1	0.5	mg/L	325.2 (1)	04/22/92	DTJ
Conductivity (Filt.)	153	1	umhos/cm @25dC	120.1 (1)	04/24/92	MW
Fluoride (Filt.)	0.5	0.1	mg/L	340.3 (1)	04/23/92	DTJ
Hardness, Total (Filt.)	1	1	mg/L CaCO3	314A (3)	04/16/92	TLK
Nitrogen, Total Kjeldahl (Filt.)	<1	1	mg/L (as N)	351.3 (1)	04/20/92	RMN
Nitrogen, Nitrate (Filt.)	0.3	0.1	mg/L (as N)	353.2 (1)	04/22/92	MW
Nitrogen, Nitrite (Filt.)	<0.01	0.01	mg/L (as N)	353.2 (1)	04/22/92	MW
pH (Filt.)	9.72	0.01	pH Units	150.1 (1)	04/24/92	MRC
Solids, Total Dissolved (TDS)	105	10	mg/L	160.1 (1)	04/15/92	RMN
Sulfate (Filt.)	<10	10	mg/L	300.1 (1)	04/27/92	PJM
Antimony, Diss. (Sb)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Arsenic, Diss. (As)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Barium, Diss. (Ba)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Cadmium, Diss. (Cd)	<0.005	0.005	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Calcium, Diss. (Ca)	0.3	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Chromium, Diss. (Cr)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Copper, Diss. (Cu)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Iron, Diss. (Fe)	<0.03	0.03	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Lead, Diss. (Pb)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Mercury, Diss. (Hg)	<0.0003	0.0003	mg/L	245.1 (1)	04/16/92	WGL
Magnesium, Diss. (Mg)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Manganese, Diss. (Mn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK

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CORE LABORATORIES

LABORATORY TESTS RESULTS
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: MONZONITE MWMP LEACHATE

LABORATORY I.D...: 920626-0006
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Nickel, Diss. (Ni)	<0.04	0.04	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Potassium, Diss. (K)	2.2	0.01	mg/L	258.1 (1)	04/16/92	TLK
Selenium, Diss. (Se)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Silver, Diss. (Ag)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Sodium, Diss. (Na)	30	1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Uranium, Diss. (U)	0.001	0.001	mg/L	908.1 (1)	04/29/92	CA
Zinc, Diss. (Zn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Gross Alpha, dissolved	ND		pCi/l	EPA 900.0	05/01/92	CA
Gross Alpha, diss., error, +/-	1.5		pCi/l		05/01/92	CA
Gross Alpha, diss., LLD	2.7		pCi/l		05/01/92	CA
Radium 226, dissolved	0.3		pCi/l	EPA 903.1	05/13/92	CA
Radium 226, diss., error, +/-	0.5		pCi/l		05/13/92	CA
Radium 226, diss., LLD	0.8		pCi/l		05/13/92	CA
Radium 228, dissolved	ND		pCi/l	EPA 904.0	05/12/92	CA
Radium 228, diss., error, +/-	2.7		pCi/l		05/12/92	CA
Radium 228, diss., LLD	5.0		pCi/l		05/12/92	CA

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Aurora, CO 80012
(303) 751-1780

L A B O R A T O R Y   T E S T S   R E S U L T S
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: ALLUVIUM MWMP LEACHATE

LABORATORY I.D...: 920626-0007
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Alkalinity, Total (Filt.)	49	5	mg/L CaCO3	310.1 (1)	04/24/92	MRC
Chloride (Filt.)	14.6	0.5	mg/L	325.2 (1)	04/22/92	DTJ
Conductivity (Filt.)	262	1	umhos/cm @25dC	120.1 (1)	04/24/92	MW
Fluoride (Filt.)	0.6	0.1	mg/L	340.3 (1)	04/23/92	DTJ
Hardness, Total (Filt.)	26	1	mg/L CaCO3	314A (3)	04/16/92	TLK
Nitrogen, Total Kjeldahl (Filt.)	<1	1	mg/L (as N)	351.3 (1)	04/20/92	RMN
Nitrogen, Nitrate (Filt.)	1.6	0.1	mg/L (as N)	353.2 (1)	04/22/92	MW
Nitrogen, Nitrite (Filt.)	0.02	0.01	mg/L (as N)	353.2 (1)	04/22/92	MW
pH (Filt.)	9.15	0.01	pH Units	150.1 (1)	04/24/92	MRC
Solids, Total Dissolved (TDS)	167	10	mg/L	160.1 (1)	04/15/92	RMN
Sulfate (Filt.)	38	10	mg/L	300.1 (1)	04/27/92	PJM
Antimony, Diss. (Sb)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Arsenic, Diss. (As)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Barium, Diss. (Ba)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Cadmium, Diss. (Cd)	<0.005	0.005	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Calcium, Diss. (Ca)	6.7	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Chromium, Diss. (Cr)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Copper, Diss. (Cu)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Iron, Diss. (Fe)	<0.03	0.03	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Lead, Diss. (Pb)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Mercury, Diss. (Hg)	<0.0003	0.0003	mg/L	245.1 (1)	04/16/92	WGL
Magnesium, Diss. (Mg)	2.3	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Manganese, Diss. (Mn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK

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CORE LABORATORIES

LABORATORY TESTS RESULTS
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: ALLUVIUM MWMP LEACHATE

LABORATORY I.D...: 920626-0007
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Nickel, Diss. (Ni)	<0.04	0.04	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Potassium, Diss. (K)	6.6	0.01	mg/L	258.1 (1)	04/16/92	TLK
Selenium, Diss. (Se)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Silver, Diss. (Ag)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Sodium, Diss. (Na)	37	1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Uranium, Diss. (U)	0.001	0.001	mg/L	908.1 (1)	04/29/92	CA
Zinc, Diss. (Zn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Gross Alpha, dissolved	ND		pCi/l	EPA 900.0	05/01/92	CA
Gross Alpha, diss., error, +/-	1.9		pCi/l		05/01/92	CA
Gross Alpha, diss., LLD	3.3		pCi/l		05/01/92	CA
Radium 226, dissolved	ND		pCi/l	EPA 903.1	05/13/92	CA
Radium 226, diss., error, +/-	0.3		pCi/l		05/13/92	CA
Radium 226, diss., LLD	0.5		pCi/l		05/13/92	CA
Radium 228, dissolved	2.6		pCi/l	EPA 904.0	05/12/92	CA
Radium 228, diss., error, +/-	3.0		pCi/l		05/12/92	CA
Radium 228, diss., LLD	4.6		pCi/l		05/12/92	CA

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CORE LABORATORIES

LABORATORY TESTS RESULTS
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: BASALT MWMP LEACHATE

LABORATORY I.D...: 920626-0008
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Alkalinity, Total (Filt.)	38	5	mg/L CaCO3	310.1 (1)	04/24/92	MRC
Chloride (Filt.)	2.4	0.5	mg/L	325.2 (1)	04/22/92	DTJ
Conductivity (Filt.)	487	1	umhos/cm @25dC	120.1 (1)	04/24/92	MW
Fluoride (Filt.)	0.4	0.1	mg/L	340.3 (1)	04/23/92	DTJ
Hardness, Total (Filt.)	163	1	mg/L CaCO3	314A (3)	04/16/92	TLK
Nitrogen, Total Kjeldahl (Filt.)	2	1	mg/L (as N)	351.3 (1)	04/20/92	RMN
Nitrogen, Nitrate (Filt.)	5.6	0.3	mg/L (as N)	353.2 (1)	04/22/92	MW
Nitrogen, Nitrite (Filt.)	<0.01	0.01	mg/L (as N)	353.2 (1)	04/22/92	MW
pH (Filt.)	8.99	0.01	pH Units	150.1 (1)	04/24/92	MRC
Solids, Total Dissolved (TDS)	337	10	mg/L	160.1 (1)	04/15/92	RMN
Sulfate (Filt.)	159	20	mg/L	300.1 (1)	04/27/92	PJM
Antimony, Diss. (Sb)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Arsenic, Diss. (As)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Barium, Diss. (Ba)	0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Cadmium, Diss. (Cd)	<0.005	0.005	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Calcium, Diss. (Ca)	47.9	0.5	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Chromium, Diss. (Cr)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Copper, Diss. (Cu)	0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Iron, Diss. (Fe)	<0.03	0.03	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Lead, Diss. (Pb)	<0.05	0.05	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Mercury, Diss. (Hg)	<0.0003	0.0003	mg/L	245.1 (1)	04/16/92	WGL
Magnesium, Diss. (Mg)	10.5	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Manganese, Diss. (Mn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK

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CORE LABORATORIES

LABORATORY TESTS RESULTS
05/13/92

JOB NUMBER: 920626 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

CLIENT I.D.........: AZCO'S SANCHEZ COPPER PROJ.
DATE SAMPLED.......: 04/14/92
TIME SAMPLED.......: 10:00
WORK DESCRIPTION...: BASALT MWMP LEACHATE

LABORATORY I.D...: 920626-0008
DATE RECEIVED....: 04/14/92
TIME RECEIVED....: 10:00
REMARKS..........: LIXIVIANT

TEST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECHN
Nickel, Diss. (Ni)	<0.04	0.04	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Potassium, Diss. (K)	10.8	0.01	mg/L	258.1 (1)	04/16/92	TLK
Selenium, Diss. (Se)	<0.1	0.1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Silver, Diss. (Ag)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Sodium, Diss. (Na)	23	1	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Uranium, Diss. (U)	0.001	0.001	mg/L	908.1 (1)	04/29/92	CA
Zinc, Diss. (Zn)	<0.01	0.01	mg/L	200.7/6010 (1,2)	04/16/92	TLK
Gross Alpha, dissolved	3.0		pCi/l	EPA 900.0	05/01/92	CA
Gross Alpha, diss., error, +/-	3.5		pCi/l		05/01/92	CA
Gross Alpha, diss., LLD	5.3		pCi/l		05/01/92	CA
Radium 226, dissolved	0.3		pCi/l	EPA 903.1	05/13/92	CA
Radium 226, diss., error, +/-	0.4		pCi/l		05/13/92	CA
Radium 226, diss., LLD	0.5		pCi/l		05/13/92	CA
Radium 228, dissolved	1.8		pCi/l	EPA 904.0	05/12/92	CA
Radium 228, diss., error, +/-	2.5		pCi/l		05/12/92	CA
Radium 228, diss., LLD	3.8		pCi/l		05/12/92	CA

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REPORT ON
SANCHEZ WASTE SAMPLING
FOR
WASTE CHARACTERIZATION TESTS

Introduction

The Arizona Department of Environmental Quality, under the Aquifer Protection Permit program, requires that natural mine waste materials (rock, alluvium, etc.) be characterized as to acid generating potential and leachable constituents.

At the request of Mr. Richard C. Moores II, Vice President of AZCO Mining Inc., I collected samples to characterize the waste material from the planned Sanchez Copper Project open pit mine to be developed near Safford, Arizona.

The Sanchez open pit will produce approximately 200 million tons of waste material over its proposed 17 year life. The waste material will consist of the following:

Andesite	approx. 58%
Quartz monzonite porphyry (monzonite)	3%
Alluvium	23%
Basalt	16%

All of these materials are exposed at the surface. In addition, samples of andesite and monzonite waste from within the orebody are available from diamond drill core.

Procedure

On November 7, 1991, I visited the Sanchez open pit site and took three samples of alluvium and three of basalt. Approximately 150 lbs. of each material type were taken from different areas around the pit, as shown on Figure 1. The criteria used in selecting the sample sites were:

1) "fresh" exposure of in-place material,
2) widely separated from other samples of the same material, and
3) reasonably easy to get to

Samples were chipped or dug from vertical or near vertical exposures. An attempt was made to select only unweathered material from as low on the exposure as possible. Samples were placed in either five gallon plastic pails or sample bags, sealed and tagged. Samples were then delivered to Metcon Research Inc. in Tucson for preparation for testing.

Near surface samples of basalt and alluvium are most appropriate for testing since most of these materials occur in a near-surface

environment in the pit area. Much of the andesite and monzonite waste, however, is from deep within the orebody. I therefore decided to use samples of these materials from diamond drill core to more accurately represent these rock types.

Mr. Harold Downey, a consulting geologist who was involved in the logging of the Sanchez drill core, was asked to select representative samples from the core stored in the Sanchez core warehouse for testing. The criteria were:

1) material below ore grade (less than 0.1% copper, and
2) reasonable distribution within the orebody.

Core samples were selected by Mr. Downey based on the above criteria and the availability of appropriate samples. In the case of monzonite, only one hole (H414) was found to have sufficient core which met the criteria. The holes, interval selected and copper grade are given below.

Material	Hole	Interval*	% Copper
Andesite 1	H453	237-276	0.02
2	H704	100-110	0.03
3	H462	270-307	0.06
Monzonite 1,2,3	H414	364-401	0.01

* Depth from surface

The hole locations are shown on Figure 1. At least 50 lbs. of material was obtained for each Andesite sample. The three monzonite samples were obtained from approximately 50 lbs. of material.

These samples were delivered to Metcon by Mr. Downey in plastic bags or the original sample boxes.

Fred B. Brost

Fred B. Brost, P.E.
March 24, 1992

Registered Professional Engineer
CERTIFICATE NO.
11360
FREDRIC B. BROST
Date Signed 1/24/92
ARIZONA, U.S.A.

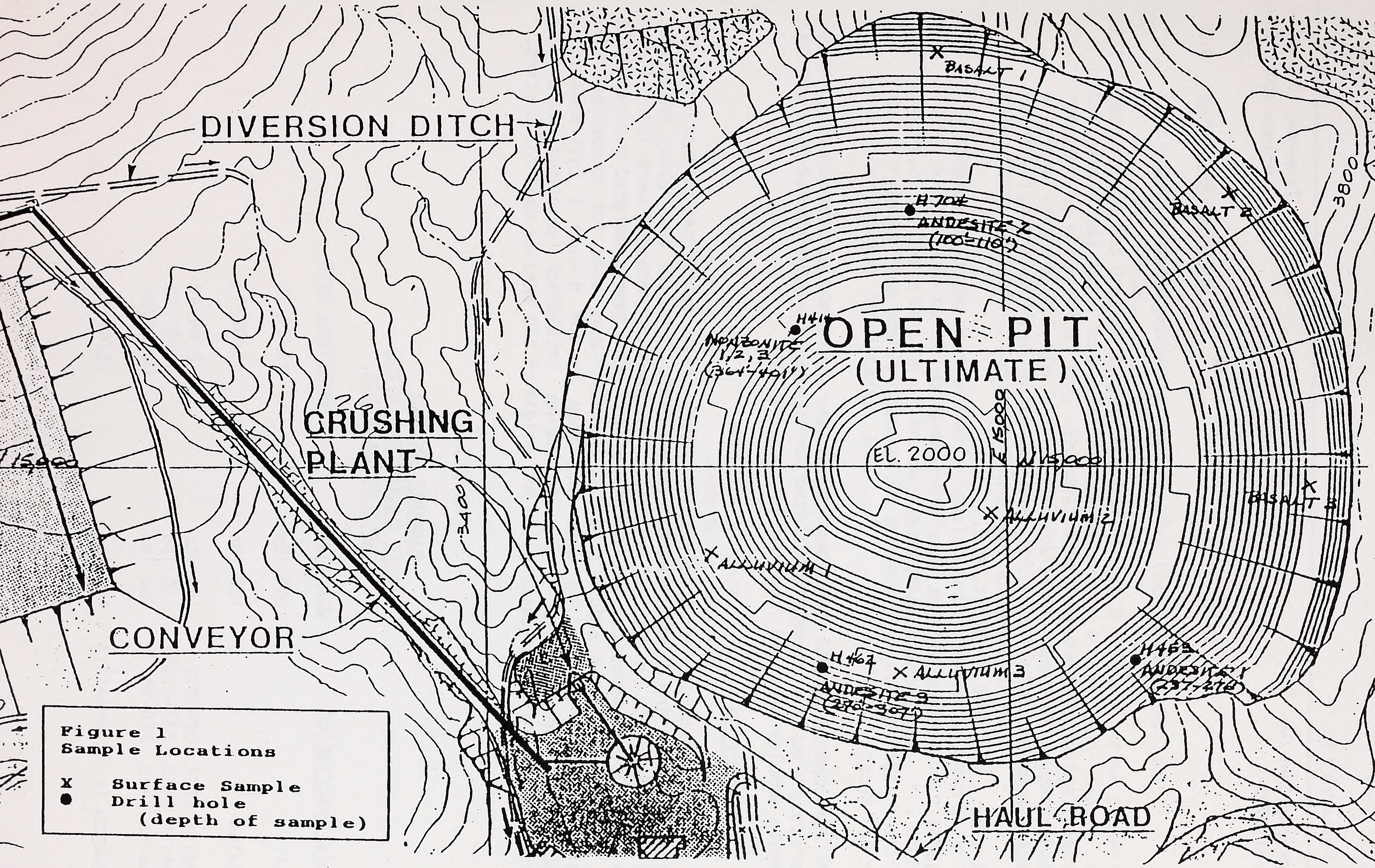

Figure 1
Sample Locations

X Surface Sample
● Drill hole
(depth of sample)

METCON Research Inc.

1844 W. Grant Road, Suite 106
Tucson, Arizona 85745

Telephone: (602) 623-1327
Facsimile: (602) 620-0268

7 April 1992
EI-028-92

Mining & Environmental Consultants, Inc.
2338 West Royal Palm, Suite E
Phoenix, Arizona 85021

Attention: Mr. Fred B. Brost, P.E.

Subject: Sanchez Project Sample Preparation
Waste Characterization

Dear Mr. Brost:

Pursuant to instructions received in your letter dated 24 March 1992, this report describes the procedures utilized during sample preparation work conducted on waste samples provided from the Sanchez Project.

1.0 INTRODUCTION

During the months of January and February, 1992, two suites of samples were received from Mining & Environmental Consultants, Inc. at the Metcon Research Laboratory facility in Tucson, Arizona. The samples received were identified Basalt, Alluvium, Andesite, and Monzonite, and each sample weighed between 100 and 120 lbs. All the sample preparation techniques used for production of samples suitable for testing were specified by the Mining & Environmental Consultants representative. The following tabulation provides specific information regarding the description and origin of the samples used for testing.

Table_1.1

SANCHEZ PROJECT
WASTE CHARACTERIZATION
SAMPLE PREPARATION

Sample Description	Quantity	Received date
Basalt	100 lbs	12/09/91
Alluvium	100 lbs	12/09/91
Andesite (704,100-107)	50 lbs	12/09/91
Andesite (453, 237-276)	50 lbs	02/07/92
Andesite (462, 270-307)	50 lbs	02/07/92
Monzonite (414, 364-401)	100 lbs	02/07/92

2.0 SAMPLE PREPARATION

Sample preparation procedure used in this test were as follows:

2.1 Each sample was crushed to approximately minus 2 inches. After crushing, the sample was split to a size of approximately 4 kgs. The rejects were returned to the original bag. The 4 kg split sample was divided into two portions weighing 2.5 and 1.5 kg respectively. Details of the sample preparation are outlined in the document entitled "Sanchez Copper Project Waste Characterization Sample Preparation" attached hereto.

2.2 The samples produced were properly labeled and packaged as instructed by Mining & Environmental Consultants, Inc., and were shipped to Core Labs in Colorado, to the attention of Mr. Dave Mcwarter, Lab Manager. All of the sample rejects from sample preparation procedures were returned to Mining and Environmental Consultants, Inc.

If you have any questions, or if this project should require further discussion, please do not hesitate to contact the writer.

Very truly yours,
Eugenio Iasillo
Eugenio Iasillo
Process Engineer

EI:msb
Attachment

SANCHEZ COPPER PROJECT
WASTE CHARACTERIZATION SAMPLE PREPARATION

Material needed for waste characterization tests:

One 2.5 kg sample of -5 cm material for each rock type (basalt waste, alluvium waste, andesite waste and monzonite waste).

One 1.5 kg sample of -10 mesh material for each rock type.

NOTE: Sample weights specified are the minimum required. About 10% more should be shipped.

Material available at Metcon:

Two 5 gal buckets plus one sample bag of basalt waste. These constitute the 3 samples of this rock type referred to below in the Metcon procedure.

Two 5 gal. buckets plus one sample bag of alluvium waste. These constitute the 3 samples of this rock type.

Six core boxes plus one sample bag of andesite waste. The core boxes are marked and have copper grades as follows:

Box Marking		Cu grade
Hole 704	90-100 ft.	0.02
"	100-110	0.03
"	310-320	0.02
"	320-330	0.01

Interval 90-100 ft. is Andesite Waste Sample 1. Interval 100-110 is Andesite Waste Sample 2. Interval 320-330 is Andesite Waste Sample 3. Interval 310-320 and the material in the sample bag will not be used.

One sample bag of monzonite waste. The required samples will have to be split from this bag.

Metcon sample prep procedure:

1. Crush the three samples of basalt waste separately to -5 cm.
2. Split each sample down to 4 kg (see note above regarding weight). Retain rejects in the original container.
3. Split the 4 kg into 2.5 kg and 1.5 kg parts. The 2.5 kg part should be as coarse as possible and the 1.5 kg part as fine as possible.
4. Crush the 1.5 kg part to -10 mesh.
5. Package the 1.5 kg part in a plastic bag and mark it "For acid generation test - Sanchez Basalt 1, 2, or 3 (as appropriate)".
6. Mix the 2.5 kg parts from the 3 basalt samples and split down to a single 2.5 kg composite. Retain the

rejects and mark the container "Basalt Composite Rejects" for return to Liximin.

7. Package the 2.5 kg composite in a plastic bag and mark it "For MWMT - Sanchez Basalt".

Repeat the procedure for alluvium and andesite waste. For monzonite waste, step 6 will have to be omitted since there is only one sample.

Package the marked bags from steps 5 and 7 and send them to:

Core Labs
1300 S. Potomac Street, Suite 130
Aurora, CO 80012

ATTN: Mr. Dave McWharter, Lab Manager.

Return the rejects from steps 2 and 6 to Liximin.

Call Fred Brost at (602) 995-2272 if you have questions.

***

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CORE LABORATORIES
A N A L Y T I C A L   R E P O R T

Job Number: 920497
Prepared For:

MINING & ENV. CONSULTANTS, INC.
FRED BROST
2338 W. ROYAL PALM, SUITE E
PHOENIX, AZ 85021

Date: 04/09/92

David A. McWharter
Signature

4/9/92
Date:

Name: David A. McWharter

Core Laboratories
1300 South Potomac, Suite 130
Aurora, CO 80012

Title: LABORATORY MANAGER

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CORE LABORATORIES

LABORATORY TESTS RESULTS
04/09/92

JOB NUMBER: 920497 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

SAMPLE NUMBER: 1 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: BASALT-1 REM: -10 MESH

SAMPLE NUMBER: 2 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: BASALT-2 REM: -10 MESH

SAMPLE NUMBER: 3 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: BASALT-3 REM: -10 MESH

SAMPLE NUMBER: 4 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: ALLUVIUM-1 REM: -10 MESH

SAMPLE NUMBER: 5 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: ALLUVIUM-2 REM: -10 MESH

SAMPLE NUMBER: 6 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: ALLUVIUM-3 REM: -10 MESH

TEST DESCRIPTION	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	SAMPLE 6	UNITS OF MEASURE
Total Sulfur (as S)	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	%
Pyritic Sulfur (as S)	0.08	0.08	0.30	0.06	0.08	0.06	%
Total Sulfur (Tons CaCO3/Kt)	<0.3	0.6	<0.3	<0.3	<0.3	<0.3	Tons CaCO3/Kt
Pyritic Sulfur, (Tons CaCO3/Kt)	2.5	2.5	9.4	1.9	2.5	1.9	Tons CaCO3/Kt
Acid Neutralizing Potential	93.8	103.0	83.2	84.5	13.4	84.5	Tons CaCO3/Kt

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CORE LABORATORIES

LABORATORY TESTS RESULTS
04/09/92

JOB NUMBER: 920497 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

SAMPLE NUMBER: 7 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: ANDESITE WASTE SAMPLE 2 REM: -10 MESH

SAMPLE NUMBER: 8 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: SANCHEZ ANDESITE 1 HOLE 453 REM: -10 MESH

SAMPLE NUMBER: 9 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: SANCHEZ ANDESITE 3 HOLE 462 REM: -10 MESH

SAMPLE NUMBER: 10 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: SANCHEZ MONOZONITE-1 HOLE 414 REM: -10 MESH BAG NOT LABELED 1-3

SAMPLE NUMBER: 11 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: SANCHEZ MONOZONITE-2 HOLE 414 REM: -10 MESH BAG NOT LABELED 1-3

SAMPLE NUMBER: 12 DATE RECEIVED: 03/18/92 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AKZO-SANCHEZ COPPER MINING SAMPLE: SANCHEZ MONOZONITE-3 HOLE 414 REM: -10 MESH BAG NOT LABELED 1-3

TEST DESCRIPTION	SAMPLE 7	SAMPLE 8	SAMPLE 9	SAMPLE 10	SAMPLE 11	SAMPLE 12	UNITS OF MEASURE
Total Sulfur (as S)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	%
Pyritic Sulfur (as S)	0.05	0.06	0.04	0.03	0.04	0.03	%
Total Sulfur (Tons CaCO3/Kt)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	Tons CaCO3/Kt
Pyritic Sulfur, (Tons CaCO3/Kt)	1.6	1.9	1.2	0.9	1.2	0.9	Tons CaCO3/Kt
Acid Neutralizing Potential	6.4	82.0	60.9	41.9	40.8	36.0	Tons CaCO3/Kt

1300 South Potomac, Suite 130
Aurora, CO 80012
(303) 751-1780

Western Atlas International
A Litton/Dresser Company

CORE LABORATORIES

QUALITY ASSURANCE REPORT
04/09/92

JOB NUMBER: 920497 CUSTOMER: MINING & ENV. CONSULTANTS, INC. ATTN: FRED BROST

ANALYSIS				DUPLICATES		REFERENCE STANDARDS		MATRIX SPIKES		
ANALYSIS TYPE	ANALYSIS SUB-TYPE	ANALYSIS I.D.	ANALYZED VALUE (A)	DUPLICATE VALUE (B)	RPD or (|A-B|)	TRUE VALUE	PERCENT RECOVERY	ORIGINAL VALUE	SPIKE ADDED	PERCENT RECOVERY
PARAMETER:Pyritic Sulfur (as S) REPORTING LIMIT/DF: 0.01 UNITS:%				DATE/TIME ANALYZED:03/30/92 11:00 METHOD REFERENCE :Nitric Leach				QC BATCH NUMBER:247751 TECHNICIAN:MRC		
BLANK	MB	SIO2	<0.01							
DUPLICATE	MD	920497-12	0.03	0.03	0.00					
PARAMETER:Pyritic Sulfur, (Tons CaCO3/Kt) REPORTING LIMIT/DF: 0.3 UNITS:Tons CaCO3/Kt				DATE/TIME ANALYZED:03/30/92 11:00 METHOD REFERENCE :				QC BATCH NUMBER:247752 TECHNICIAN:MRC		
BLANK	MB	SIO2	<0.3							
DUPLICATE	MD	920497-12	0.9	0.9	0.0					
PARAMETER:Acid Neutralizing Potential REPORTING LIMIT/DF: 0.1 UNITS:Tons CaCO3/Kt				DATE/TIME ANALYZED:04/02/92 11:00 METHOD REFERENCE :SOANP1				QC BATCH NUMBER:247799 TECHNICIAN:MRC		
BLANK	MB	SIO2	0.2							
DUPLICATE	MD	920497-5	13.4	13.6	1					
DUPLICATE	MD	920497-7	6.4	6.6	3					

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QUALITY ASSURANCE FOOTER
04/09/92

(1) EPA 600/4-79-020, Methods For Chemical Analysis Of Water And Wastes, March 1983
(2) EPA SW-846, Test Methods For Evaluating Solid Waste, Third Edition, November 1986
(3) Standard Methods For The Examination Of Water And Wastewater, 16th Edition, 1985
(4) EPA 600/4-80-032, Prescribed Procedures For Measurement Of Radioactivity In Drinking Water, August 1980
(5) EPA 600/8-78-017, Microbiological Methods For Monitoring The Environment, December 1978
(6) Federal Register, Friday, October 26, 1984 (40 CFR Part 136)
(7) EPA 600/4-88-039, Methods For The Determination Of Organics Compounds In Drinking Water, December 1988
(8) U.S.G.S. Methods For Determination Of Inorganic Substances In Water And Fluvial Sediments, Book 5, Chapter A1, 1985

NC = Not Calculable Due To Value(s) Lower Than The Detection Limit

NOTE: Data In QA Report May Differ From Final Results Due To Digestion And/Or Dilution Of Sample Into Analytical Ranges

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Aurora, CO 80012
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APPENDIX D

WATER QUALITY MONITORING PLAN

Water Quality Monitoring Plan
Sanchez Copper Project

The purpose of this monitoring plan is to:
1) demonstrate compliance with regulatory requirements;
2) identify potential problems at an early stage; and
3) direct remedial action should a problem be detected.

Ensuring that permit requirements are met is the joint responsibility of AZCO, the Arizona Department of Environmental Quality (ADEQ) and the BLM. AZCO is responsible for installing pollution control facilities and monitor wells and devices, inspecting facilities, obtaining and analyzing samples, and reporting results and permit violations to the ADEQ and BLM. The ADEQ and BLM exercise oversight through review of AZCO reports and site inspections. During site inspections, the agencies may obtain samples for analysis; take photos; inspect equipment, activities, facilities, monitoring equipment and methods; inspect and copy records; and interview AZCO employees. The agencies also have authority to levy fines and/or to require AZCO to stop operations or make changes in operating practices to protect the environment.

Prior to operation, the pond and solution ditch leak detection systems will be tested with water. These systems will also be checked daily during the first week of operations.

AZCO will conduct monthly facilities inspections to ensure that all pollution control facilities are operational and properly maintained.

Ground water monitoring locations and well details are provided in the Ground Water Monitoring section of the hydrological report by Geothermal Surveys, Inc., dated August, 1992. This section is included in this appendix.

Since there is no perennial water on the project site, no stream monitoring is proposed. Runoff from disturbed areas, principally the main waste rock dump and the crushing plant, mine shop and office complex will be captured and allowed to evaporate or percolate. Samples of this ponded runoff will be taken after storms which create significant runoff. The locations of the principal runoff collection ponds are shown on the General Site Plan.

The existing wells proposed for sampling are described below and are shown on Figure A of this appendix.

<u>Well 60</u> (numbers correspond to those in "Preliminary Permitting Studies, Sanchez Copper Project: by Sergent, Hauskins & Beckwith, 1989) has a total depth of 1,276 feet with water at 190 feet below surface, and is located adjacent to Big Canyon down-gradient from the leach pad, process ponds and SX-EW plant. Well 60 is designated as D(7-27)05aaa by the Arizona Department of Water Resources (DWR).

Well 87 DWR D(6-27)36abc, has an unknown total depth with water at about 100 feet below surface, and is located down-gradient from the main waste rock dump.

Well 22 DWR D(6-27)36bbd, has a total depth of 180 feet with water at about 37 feet, and is located adjacent to Pit Wash down-gradient from the open pit and mine facilities.

These wells would be sampled on a quarterly basis.

AZCO plans to construct water supply wells between Well 87 and the waste rock dump, and between Well 22 and the open pit. If these wells are constructed as planned, AZCO will monitor these wells in lieu of Wells 22 and 87.

All wells and ponds will be sampled and analyzed for pH, conductivity, total dissolved solids (TDS), copper and sulfate. If a sample shows a pH of less than 5.0, the sample will be analyzed for arsenic, barium, cadmium, chromium, lead, mercury, nitrate, selenium, silver and fluoride (these constituents have safe drinking water limits in Arizona). Normally, pH, conductivity, TDS, copper and sulfate analyses will be done at the AZCO lab. Duplicate samples will be taken once a year and analyzed at an EPA-approved lab to verify the AZCO analyses. The safe drinking water constituent analyses will be done at an EPA-approved lab.

The results of all analyses will be kept in a dedicated file at the project office and sent to the BLM and ADEQ as stipulated in the permit.

Proposed alert levels are given below:

	ALERT LEVEL	LEACH SOLUTION (typical)
pH (standard units)	6	2
Conductivity (uS/cm)	3,500	to be determined
TDS (mg/L)	3,000	29,000
Copper (mg/L)	1	3,000
Sulfate (mg/L)	1,000	19,000

Should an alert level be exceeded in a sample, AZCO will immediately resample the well to verify the analysis. If the second sample confirms the analysis, AZCO will notify the BLM and ADEQ, and when approved, implement the appropriate contingency plan.

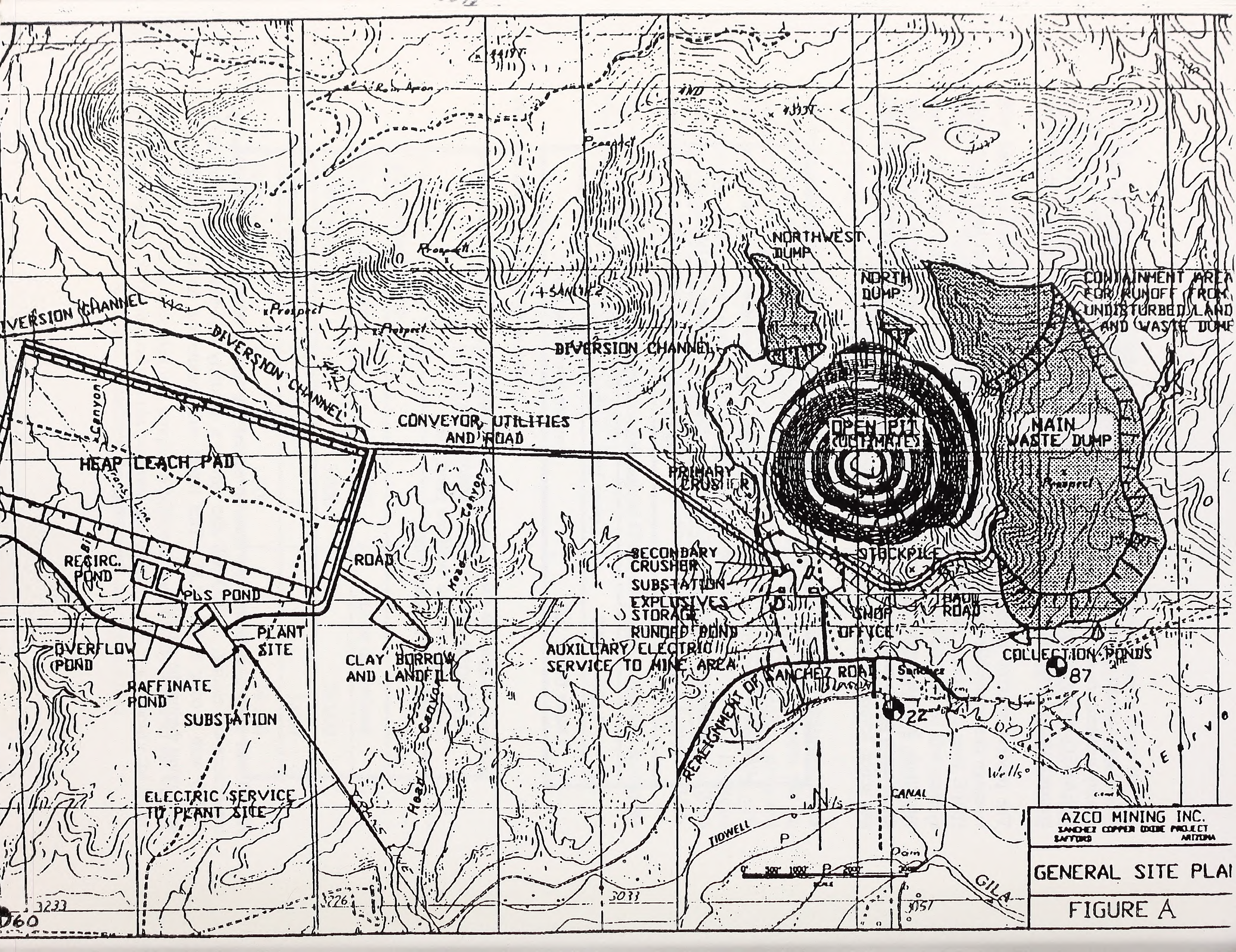
AZCO must report any accidental discharges which may result in exceedance of state water quality standards or substantial endangerment of public health or the environment to the BLM and ADEQ within 30 days. As a condition of the APP, AZCO must develop an emergency response plan to deal with likely emergencies and appoint an emergency response coordinator.

The process solution ponds and overflow pond will be double-lined and equipped with weepage detection/collection systems. The external solution ditches will have a composite HDPE over clay liner, also incorporating a weepage detection/collection system. These systems will be checked weekly and the volume of solution contained in the collection sumps measured. Estimated primary liner weepage rates are 240 gallons per acre per day (gpad) for the solution ponds and 150 gpad for the external solution ditches. A response plan with alert and action levels is given below.

WEEPAGE (gallons per acre per day)	RESPONSE
Less than 350*	Pump collected leachate into pond.
More than 350	Notify ADEQ and BLM.
350 - 1,000	Increased pumping and monitoring
1,000 - 2,500	Lower level in pond. Repair liner if possible.
More than 2,500	Initiate immediate repair.

* 0.85 gpm for the PLS and recirculation ponds,
0.35 gpm for the raffinate pond,
2.2 gpm for the overflow pond, and
0.09 gpm for each ditch.

AZCO will keep a dedicated log book to record the results of all required monitoring, inspections and testing. AZCO will also submit a quarterly Self-Monitoring Report to the ADEQ with a copy to the BLM. This report will contain the results of sampling and monitoring during the quarter.



DIVERSION CHANNEL
HEAP LEACH PAD
RECIRC. POND
PLS POND
OVERFLOW POND
RAFFINATE POND
PLANT SITE
SUBSTATION
ELECTRIC SERVICE TO PLANT SITE
ROAD
CLAY BORROW AND LANDFILL
CONVEYOR, UTILITIES AND ROAD
PRIMARY CRUSHER
SECONDARY CRUSHER
SUBSTATION
EXPLOSIVES STORAGE
RUNOFF POND
AUXILLARY ELECTRIC SERVICE TO MINE AREA
REALIGNMENT OF SANCHEZ ROAD
NORTHWEST DUMP
NORTH DUMP
OPEN PIT (ULTIMATE)
STOCKPILE
SHOP
OFFICE
HAUL ROAD
MAIN WASTE DUMP
CONTAINMENT AREA FOR RUNOFF FROM UNDISTURBED LAND AND WASTE DUMP
COLLECTION PONDS
87
22
CANAL
TIDWELL
GILA
AZCO MINING INC.
SANCHEZ COPPER OXIDE PROJECT
SAFFORD ARIZONA
GENERAL SITE PLAN
FIGURE A

PROPOSED MONITORING PROGRAM

SANCHEZ COPPER PROJECT

NEAR SAFFORD, ARIZONA

Prepared for:

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GSI/water
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South Pasadena, California 91030

29 September 1992

PROJECT TEAM

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CONTENTS

1.0 MONITORING PROCEDURES

1.1 Objectives of the Monitoring Program

This proposed monitoring program will be conducted to assure that the operations of the Sanchez Copper Project are in compliance with the Aquifer Protection Permit. This program is proposed to meet the requirements of the Arizona Administrative Code, Title 18, Chapter 9, Sections 108, Items C.2. and Sections 110,112,113,114 and 116 as they pertain to the hydrogeology.

No discharge is planned in the operation of the project and monitoring is designed for early detection of potential sources of ground water impact. The monitoring program includes the use of vadose monitoring for the leach pad. Ground water monitoring will be conducted downgradient of the leach pad, process facilities, open pit and waste dump sites. No perennial water is present on the site and no stream monitoring is proposed. Runoff from disturbed area will be collected in ponds and sampled when present. This program uses the proposed monitoring system detailed in the report by GSi/water, Hydrogeologic Studies, Sanchez Copper Project (1992).

1.2 Vadose Monitoring

The vadose monitoring system will consists of gypsum type moisture gauges installed to detect potential seepage from the leach pad. Vadose monitoring points will be installed at 300 ft intervals on the south, west and east sides of the leach pad. Each monitoring point will consist of two gypsum block-type moisture gauges installed in a single hole.

1.3 Ground Water Monitoring

Production wells downgradient of the leach pad, open pit and waste dump area will provide monitoring points in the ground water. Monitoring of these wells will provide the necessary information to determine the background chemistry of the ground water in the area. These data will also be used to determine the alert levels to be used in the monitoring program.

1.4 Surface Water Monitoring

No perennial water is present on the project site and no stream monitoring is proposed. Monitoring of runoff from disturbed areas including the waste rock dump, the crushing plant, mine shop and office complex will be captured in runoff ponds and sampled when present. Surface water sampling would also involve collecting grab samples from any surface expression of water, if present, near the site.

1.5 Weepage and Collection System Monitoring

The process solution ponds and overflow pond will be double lined and equipped with weepage detection/collection systems. The external solution ditches will have a composite HDPE over clay liner and a weepage detection/collection system. Weepage and collection system monitoring will involve measuring the volume of solution contained in the collection sumps and comparing it with anticipated weepage levels.

1.6 Determining Alert Levels

Ground water sampling and analysis conducted in the areas of compliance will be used to determine the alert levels to be used in the monitoring program. Quarterly sampling of the ground water will be conducted for at least four rounds of sampling prior to the start of mining operations. Alert levels will be determined for the ground water based on the results of the sampling and analysis. The use of an appropriate statistical method will be determined after review of the background data. If a normal distribution of parameter results is indicated, a normal mean method incorporating a 95% confidence level and incorporating a t-test methodology would be used to determine the alert levels.

The initial round of sampling will involve the analysis of the parameters listed in Table 1. Background levels can then be determined using these data. The following parameters are proposed as indicators of potential impact from mining operations after the initial levels are determined:

pH (standard units)
Conductivity (uS/cm)
TDS (mg/L)
Copper (mg/L)
Sulfate (mg/L)

Concentration levels of these parameters in the leach solution are higher than in the preliminary ground water results. Typical concentration levels in the leach pad solution are expected to be; pH 2.0, TDS 29,000 mg/L, Copper 3,000 mg/L, Sulfate 19,000 mg/L. The typical level for conductivity in the leach pad solution is to be determined but is expected to be similarly elevated.

1.7 Evaluation Procedures

Vadose, ground water and surface water monitoring will be conducted on a quarterly basis. The collection systems will be checked weekly and the volume of solution in the collection sumps measured.

The results from the quarterly monitoring and sampling will be submitted to the Arizona Department of Environmental Quality (ADEQ) within 30 days after the results are received by AZCO Mining personnel. This report will also include a summary of any

operational and/or maintenance activities, calibration operations and/or major operational problems that have occurred. An annual summary report of the monitoring program results for the previous four quarters will also be submitted to ADEQ within 60 days after receiving the fourth quarterly results.

The results from the vadose monitoring will be compared with results from prior monitoring results to determine if a significant change has occurred. If an increase in relative moisture is indicated, more frequent measurements will be taken to determine the source of the relative increase. Precipitation events are expected to affect the vadose monitoring system but should not result in increased sustainable moisture attributed to infiltration from the leach pad.

The monitoring of the collection system will involve measurement of the volume of solution contained in the collection sumps and compared with the estimated weepage rates for the liners. The primary liner for the solution ponds has an estimated weepage rate of 240 gallons per acre per day (gpa/d). The primary liner for the external solution ditches has an estimated weepage rate of 150 gpa/d. The alert level and response for the collection monitoring system are given below.

Measured Weepage Rate (gpa/d)	Response
< 350	Pump collected leachate into pond
> 350	Notify ADEQ and BLM
350 - 1000	Increase pumping and monitoring
1000 - 2500	Lower level in pond, determine feasibility of liner repair
> 2500	Initiate immediate repair

ADEQ will be notified within five days if the results of the monitoring program indicate that an alert level has been exceeded or other permit condition have been violated. A written report will be submitted to ADEQ within 30 days of the noted violation. This report will document the following:

- A description of the violation and its cause.
- The period of violation, including exact date(s) and time(s), if known, and the anticipated time period during which the violation is expected to continue.
- Any action taken or planned to mitigate the effects of the

violation or to eliminate/prevent recurrence of the violation.

- Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an Aquifer Water Quality Standard.

- Any malfunction or failure of pollution control devices or other equipment or processes.

1.8 Reporting

In addition to the monitoring reports and violation condition reports, AZCO Mining will submit to ADEQ written notice 180 days prior to any major modification to the facility. AZCO Mining will also notify ADEQ within five days after the occurrence of any of the following:

- Filing bankruptcy

- The entry of any order or judgement against AZCO for the enforcement of any environmental protection statute and in which monetary damages or civil penalties are imposed.

1.9 Contingency Plan

The following contingency plan will be followed as appropriate if the results of the monitoring program indicate that an alert level has been exceeded or other monitoring level violation.

Verification monitoring will be conducted immediately in the event ground water alert levels are exceeded. Verification monitoring will consist of re-sampling and analysis of the compliance point in question. If confirmed, analysis of the parameters in Table 1 will be conducted. Submission of a report describing the impact, causes and proposed mitigation procedures will be submitted to ADEQ following the results of increased sampling. If an impact is indicated, a proposed corrective action plan will be submitted to ADEQ for approval. The corrective action plan will describe the actions to be taken to return the facility to compliance with the permit conditions.

The same verification procedures will be followed for the vadose and collection system monitoring.

1.10 Temporary cessation, Closure, Post-closure

AZCO Mining will notify ADEQ prior to any planned short term shut-down of operations at the site. In the event of a short term shut-down, the company plans to keep a small security and maintenance staff on site for the duration. In addition, selected employees would be retained to complete any deferred maintenance projects or reclamation which could be undertaken at that time.

Mobile and other equipment would be placed in "ready storage" status.

Leaching operations and copper production at the SX-EW plant might continue for all, or part of shut-down period, depending on economic and other factors. If the leach pad and plant were shut-down, rinsing of the heap would continue without the addition of make-up water until the flow from the heap has decreased to less than the amount which can be evaporated from the ponds. The plant would be placed on standby status.

Materials and supplies which would tend to deteriorate during the shut-down would either be used, returned to suppliers or transferred to other operations.

All monitoring procedures would continue during any period of short term shut-down.

AZCO Mining will notify ADEQ prior to permanent closure of any operations and submit to ADEQ a closure plan for approval within 90 days following notification. This closure program will describe the following:

- The approximate quantities and the chemical, biological and physical characteristics of the materials to be removed from the facility;

- The destination of the materials to be removed from the facility and an indication that placement of the materials at that destination is approved;

- The approximate quantities and the chemical, biological and physical characteristics of the materials that will remain at the facility;

- The methods to be used to treat any materials remaining at the facility;

- Any limitation on future land or water uses created as a result of the facility's operations or closure activities;

- The methods to be used to secure the facility;

- An estimate of the cost of closure; and

- A schedule for implementation of the closure plan and the submission of a post-closure plan.

A current post closure plan for the facility is located in the report, <u>AZCO Mining Inc., Sanchez Copper Project Plan of Operations</u>, July 1991, Mining & Environmental Consultants, Inc. An

addition to the closure plan would include soil sampling in the leach pad area.

Sampling of the subsurface would provide information regarding existing conditions below the leach pad area. If no impact is indicated in the results of the soil sampling, the monitoring procedures in the Leach pad will be discontinued. If an impact is indicated, then it will be addressed as described in Section 1.7.

The waste dump and open pit site do not pose an impact to the ground water quality after completion of the closure procedures. Monitoring of the downgradient wells will be discontinued after closure of the facilities.

2.0 SAMPLING AND ANALYSIS PROCEDURES

2.1 Field Log Book

A field log book shall be maintained with an up-to-date record of the following information when applicable to the specific monitoring location:

- Identification of the monitoring point
- Well depth
- Static water level depth and measurement technique
- Well yield
- Purge volume and pumping rate
- Time well was purged
- Well evacuation procedure/equipment
- Sample withdrawal procedure/equipment
- Date and time of collection
- Well sampling sequence
- Types of sample containers used and sample identification numbers
- Preservatives used
- Analyses requested
- Field observations on sampling event
- Name of collector
- Climatic conditions including air temperature
- Internal temperature of field and shipping containers

2.2 Vadose Monitoring

Three measurements will be taken from each of the two moisture gauges at each monitoring point. The average of the three measurements will be recorded for each of the gauges. Calibration of the measurement device will be conducted prior to and after completing the measurements at each point of compliance. Re-measurement will be conducted if the calibration measurement is different by 5% or greater. If the measurement device is unable to maintain an accurate calibration, it will be replaced.

2.3 Ground Water Sampling

All sampling activities will be conducted on a polyethylene sheet to be laid around the well. The static water level and total depth of the well will be measured and recorded in a field log book prior to sampling. The water level measuring instruments will be field-tested using distilled water. The volume of water in the well casing will be determined using the static water level data.

Three to five well volumes of ground water will be purged from the well before samples are collected. Evacuation will be accomplished using a dedicated PVC, stainless steel or teflon bailer. Dedicated bladder pumps and/or submersible stainless steel pumps will be considered as alternative evacuation methods. Conductance, pH and temperature will be measured after each well volume is purged. Purging will continue until successive measurements of the conductance, pH and temperature stabilize.

Samples shall be collected using one of the aforementioned sampling devices as soon as the well has fully recharged. The first sample volume will be tested for pH, temperature and conductance using portable calibrated instruments. The instrument readings will be recorded in the field log book. Samples collected for laboratory analysis will be placed in pre-cleaned containers and preserved as indicated in Table 1. If more than one sampling device volume is necessary to obtain the required volume of sample, the sampling device will be decontaminated prior to re-entering the well by rinsing with distilled water.

The samples will be sealed and labeled immediately once they have been placed and preserved. Equipment and procedures that minimize sample transfer will be used. The head space in the sampling container will not exceed 10% of the container volume.

Sampling equipment will be decontaminated before use, between samples and after use. All samples will be decontaminated prior to shipment to the laboratory. The following procedures will be followed as a minimum for decontamination of the sampling equipment:

- Remove visible contamination by wiping with an absorbent cloth
- Wash with laboratory grade, non-phosphate detergent and soft bristle brush
- Rinse with distilled water and collect distilled rinse-ate for analysis
- Visually inspect the equipment to verify effective decontamination
- Repeat steps if residual contamination is detected.

Any waste generated during the sampling activities will be disposed of and labeled in accordance with all applicable State and Federal regulations.

2.4 Surface Sampling

Surface water sampling involves the sampling of runoff ponds and any other surface expression of water if present in the project area. Grab samples of surface water will be obtained using dedicated, pre-cleaned glass beakers. The point of sampling will be chosen to ensure that the sample is representative of the water to be tested. Sampling will be avoided where there is visible surface debris. A separate container will be used for sample collection. These samples will be collected and analyzed according to the monitoring program and parameters listed in this report.

Decontamination and disposal procedures will be followed as described in the ground water sampling, Section 2.3, of this report.

2.5 Sample Transportation and Chain of Custody

All samples will be labeled, custody sealed, blister wrapped, sealed in a Ziploc type plastic bag and placed in a cooler immediately after collection. The cooler shall maintain a constant temperature of 4 degrees C. Labels will contain the following information:

- Sample number
- Sample time and date
- Sample location and depth
- Analyses required
- Preservatives added
- Sampler's name

Samples will be packaged for transportation to the laboratory in durable coolers that will maintain a constant temperature of 4 degrees C. Completed chain of custody forms placed in ziploc type bags will be taped to the underside of the cooler lids. The front and back cooler lids will be custody sealed and taped closed. The chain of custody form will include the following information: (An example is shown in Figure 1.)

- Sample numbers
- Signature of collector
- Date and time of collection
- Sample type
- Identification of source
- Number of enclosed containers
- Analyses required
- Signature of person(s) involved in the chain of possession
- Inclusive dates of possession
- Internal temperature of shipping container when samples were sealed into the container

2.6 Quality Control Samples

Three types of Quality Assurance/Quality Control (QA/QC) samples will be used to assess the effects of field and laboratory error on data quality. First, 10% of the total samples will be duplicated. Duplicate samples will be prepared, managed and analyzed at an alternative laboratory using identical procedures. Second, equipment blank samples will be used to verify the effectiveness of decontamination procedures and to screen for potential cross contamination. A field blank will be prepared by collecting a grab sample of the final composite rinseate from the equipment cleaning operations each day sampling is performed. Field blank samples will be analyzed for the same parameters as the samples. Third, a trip blank sample of distilled water will be placed in each outer package of samples sent to the laboratory for analysis.

2.7 Laboratory Requirements

All samples will be analyzed by a laboratory certified in the State of Arizona to perform the specified analyses. The laboratory will submit its quality assurance plan for approval prior to commencement of analytical work. At a minimum, the plan shall document the following:

- Sample custody and management practices
- Sample preparation and analytical procedures
- Instrumentation maintenance and calibration procedures
- Internal QA/QC measures, including the use of method blanks

The laboratory shall also provide batch-specific, quality control results for the samples submitted for analysis. No analytical work will start without written approval of the plan.

Client: ____________________
Contact: ____________________ Phone: ____________________
Address: ____________________ Fax: ____________________

Project: ____________________

Remarks: ____________________

Lab ID	Field ID	Date/Time	Bottle Type	No.	Preserv.	Matrix	Analyses									Comments

Relinquished: ____________ Date/Time: ____________ Received by: ____________
Relinquished: ____________ Date/Time: ____________ Received by: ____________
Relinquished: ____________ Date/Time: ____________ Received by: ____________

Figure 1
CHAIN OF CUSTODY RECORD

AZCO Mining Inc.
Sanchez Copper Project

9/28/92 GSI/water

Table 1
Parameters for Analysis

Parameter	Method (EPA)	Detection Limit	Sample Container	Volume (ml)	Preservation Method
GENERAL MINERALS					
Alkalinity	310.1	2.0 mg/l	P/G	20	Cool 4° C
Calcium	215.1	0.20 mg/l	P/G	20	Cool 4° C
Chlorides	Std. 407c	1.0 mg/l	P/G	50	None
Copper	220.1	0.10 mg/l	P/G	300	pH <2 HNO_3
Fluoride	340.2	0.20 mg/l	P	50	None
Hardness	130.2	10 mg/l	P/G	20	pH <2 HNO_3
Iron	236.1	0.10 mg/l	P/G	300	pH <2 HNO_3
Magnesium	242.1	0.10 mg/l	P/G	300	pH <2 HNO_3
Manganese	243.1	0.05 mg/l	P/G	300	pH <2 HNO_3
Nitrate	353.3	0.20 mg/l	P/G	20	Cool 4° C
pH	150.1	± 0.1	P/G	20	Cool 4° C
Potassium	258.1	5.0 mg/l	P/G	20	Cool 4° C
Sodium	273.1	5.0 mg/l	P/G	20	Cool 4° C
EC	120.1	10umhos/cm^2	P/G	50	Cool 4° C
Sulfate	375.2	10 mg/l	P/G	50	Cool 4° C
MBAS	425.1	1 mg/l	P/G	250	Cool 4° C
TDS	160.1	10 mg/l	P/G	100	Cool 4° C
Zinc	289.1	0.05 mg/l	P/G	300	Cool 4° C
TRACE METALS					
Arsenic	206.3	0.010mg/l	P/G	300	pH <2 HNO_3
Barium	208.1	0.010mg/l	P/G	300	pH <2 HNO_3
Cadmium	213.2	0.0010mg/l	P/G	300	pH <2 HNO_3
Chromium	218.2	0.010mg/l	P/G	300	pH <2 HNO_3
Lead	239.2	0.010mg/l	P/G	300	pH <2 HNO_3
Mercury	245.1	0.0005mg/l	P/G	300	pH <2 HNO_3
Molybdenum	246.1	0.1 mg/l	P/G	300	pH <2 HNO_3
Selenium	270.2	0.005mg/l	P/G	300	pH <2 HNO_3
Silver	272.2	0.001mg/l	P/G	300	pH <2 HNO_3

PROPOSED MONITORING SYSTEM

Figure 2: Location of Monitoring Points

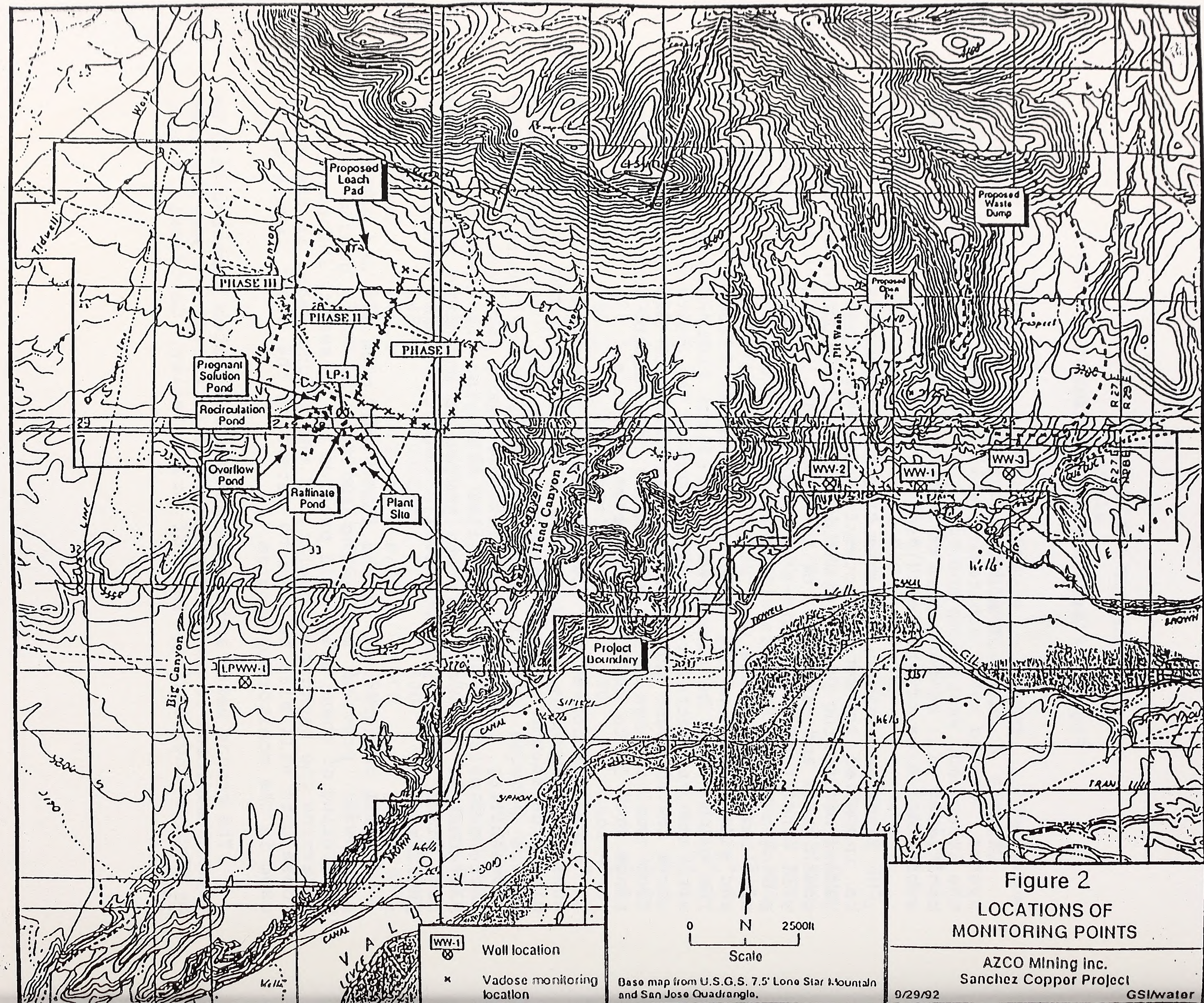
Figure 2 shows the locations of the proposed monitoring system. Ground water monitoring will be conducted downgradient of the leach pad, waste dump and open pit areas. Additionally, vadose monitoring will be conducted to monitoring moisture content in the subsurface area of the leach pad.

A vadose monitoring system of gypsum-type moisture gauges will be installed to detect potential seepage from the leach pad. Vadose monitoring points will installed at 300 ft intervals on the south, west and east sides of the leach pad. Each monitoring point will consist of two qypsum-block-type moisture gauges installed in a single hole. The hole will be drilled to the top of the clay and silt beds. One gauge will be positioned near the top of the clay and silt beds, and the other approximately 5 ft above the first. The gauges will be completed in a silica flour grout to conform with the manufacturer's instructions. The portion of the hole above the moisture gauges will be backfill with the native material from the cuttings. The monitoring hole depths are expected to range from 10 to 80 ft in the leach pad area.

The location of the vadose monitoring system is based on the subsurface geology of this area and the projected migration of discharge should it occur from the leach pad. The clay and silt layers provide a near horizontal surface of increased lower permeability. Infiltration from the leach pad would result in increased moisture of the material overlying the clays and silts. Placement of the soil moisture gauges at and above the clay and silt beds will provide early detection of potential pad infiltration.

Wells downgradient of the leach pad, open pit and waste dump area will provide monitoring points in the ground water. Monitoring of these areas will provide the necessary information to determine the background quality of the ground water in the area. These data will also be used to determine the alert levels to be used in the monitoring program.

The ground water and vadose monitoring system proposed will be used in addition to pond and ditch leach detection systems designed by Vector Engineering, Inc. of Grass Valley, California (June, 1992).



Base map from U.S.G.S. 7.5' Lone Star Mountain and San Jose Quadrangle.

Figure 2
LOCATIONS OF MONITORING POINTS

AZCO Mining Inc.
Sanchez Copper Project

9/29/92 GSI/water

REFERENCES

Arizona Administrative Code, Title 18, 1990.

GSi/water, 1992, Hydrologic investigations, Sanchez copper project near Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

GSi/water, 1992, Hydrogeologic setting of the Sanchez copper project near Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

GSi/water, 1992, Aquifer characteristics, Sanchez copper project near Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

GSi/water, 1992, Results of ground water sampling, Sanchez copper project near Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

GSi/water, 1992, Ground water inflows - proposed pit area, Sanchez copper projectnear Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

GSi/water, 1992, Calculated influence on local wells from ground water withdrawals, Sanchez copper project near Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

GSi/water, 1992, Assessment of potential ground water impacts and proposed monitoring system, near Safford, Arizona: prepared for Mining & Environmental Consultants, Inc., Phoenix, Arizona.

Houser, B.B., Richter, D.H. and Shatiqullah, 1985, Geologic map of the Safford quadrangle, Graham County, Arizona: USGS Misc. Invest. Map - I1617.

Mining & Environmental Consultants, Inc., July 1991, Sanchez copper project plan of operations.

Sergent, Hauskins & Beckwith, 1990, Geotechnical investigation report Sanchez copper project near Safford, Arizona, prepared for Wright Engineers Limited, Vancouver, B.C. Canada.

APPENDIX E

WORST CASE SCENARIO

Worst Case Scenario

All streams in the project area are ephemeral, flowing only during periods of intense rainfall. The nearest perennial stream is the Gila River, located approximately four miles downstream via Big Canyon wash from the process area (the leach pad, process ponds and SX-EW plant). The worst case impact on surface water would occur due to the discharge of process solution into Big Canyon wash and subsequently into the Gila River.

As required by the Arizona Department of Environmental Quality (ADEQ and good design practices), runoff from the surrounding area will be diverted away from the leach pad and process ponds and discharged to natural drainage channels. Diversion channels have been designed to carry runoff from at least the 100 year, 24 hour storm. The runoff which will report to the ponds is therefore limited to that derived from precipitation falling inside the diversion ditches.

The process ponds will be built primarily in cut with low surrounding berms and a designed spillway. A catastrophic failure due to collapse of the containment dike is therefore not likely. A likely worst case would therefore be a controlled rèlease of process solution over the spillway.

All process ponds are interconnected to allow utilization of all available capacity before a release occurs. The raffinate, PLS and recirculation ponds will be built prior to the start of operations. The overflow pond will be built before the construction of phase 2 of the leach pad to allow for runoff from the increased pad area.

The ponds are sized to contain the maximum working volume, plus 24 hours heap drain-down, plus the maximum cumulative storage (the wettest year on record and the 100 year, 24 hour storm). The ponds and their sizing are discussed in more detail in Section 2.1.6.2.

The principal pollutants in the process solutions are copper and sulfuric acid. The maximum solution inventory, along with copper and acid content, are given in Table 1.

TABLE 1

POND	WORKING VOLUME	COPPER (g/L)	ACID (g/L)
PLS	6MM gal	3.6	3
Recirc.	6MM gal	2.2	4

If the contents of the ponds were discharged into Big Canyon wash during a major storm, the copper and acid content of the solution would be diminished by:

* dilution by the considerable runoff generated by the storm, and
* acid neutralization/metals precipitation (as insoluble compounds) from solution contact with the basic runoff[1], basic sediments in the stream bed and banks[2], and basic sediment which would be transported during periods of high runoff.

Dilution depends upon the pollutant concentration in the ponds, the rate of release and the flow in the receiving stream. In a major storm, the flow in a given stream would be approximately proportional to the area drained. This would apply to the leach pad as well as natural areas. Assuming a case in which the process ponds would contain 50% process solution and 50% runoff (working volume plus 24 hours drain down plus major storm runoff), the copper and acid content of a release would be reduced at various points as shown on Table 2 below.

TABLE 2
EFFECT OF DILUTION ONLY ON RELEASE

POINT	RUNOFF AREA (A)	COPPER (g/L)	ACID (g/L)
Release from pond	100*	1.45	1.75
Entering Big Canyon wash	960	0.15	0.18
Entering Gila River	2880	0.05	0.06

* Phase 1 pad

In an actual release, the acid would probably be neutralized before the release reaches the Gila River. Once in the river, massive dilution could be expected.

Based on the above, no damage to fields, domestic animals or wildlife is anticipated from a complete release of the contents of the solution ponds.

---

[1] Local streams have a pH of about 8 (see Preliminary Permitting Studies, SH&B 1989, and Addendum 2, dated Oct. 15, 1991.

[2] Samples of alluvium indicated an average acid neutralization potential of 61 tons $CaCO_3$/Kt (see Report on Waste Material Testing, M&EC 1992).

[3] Estimated on the basis of runoff area.

Ground Water Protection

Ground water in the area of the leach pad, ponds and SX-EW plant is at least 200 feet below surface, as evidenced by the lack of springs and seeps in the deeply incised canyons and the valley escarpments, and well data. Drill holes, test pits and canyon exposures indicate that the area is underlain by a layer of lime-cemented gravels 30 to 50 feet thick, and silty lacustrine clays to an undetermined depth.[4]

The leach pad will be lined with compacted clay at least 12 inches thick. The hydraulic head on the liner will be kept low by a network of perforated pipe in a drainage layer on top of the liner. The pad is divided internally into a series of cells separated by 2 ft. berms. Monitor wells will be located at strategic points around the pad and pond/plant area to detect leaks. Solution ditches will be lined with a composite 80 mil HDPE over compacted clay liner, incorporating a leak detection collection system. Process solution ponds will be built with double HDPE liners (60 mil over 40 mil) with a leak detection/collection system (see Section 2.1.6).

The greatest potential impact to ground water would be from a gross leak in the leach pad liner. Should this occur, the acid in the solution would be neutralized on contacting the calcium carbonate in the cemented gravels. Lab tests have shown that this layer has a high acid neutralizing potential and tends to be self sealing through the formation of gypsum.[5,6] Any unneutralized solution migrating through the cemented gravel layer would be stopped by the lacustrine clays before reaching ground water. Monitor wells constructed to the top of the clay would detect any solutions migrating along the gravel-clay interface. Wells could then be installed to pump the solution back to a process pond.

All ponds and overflow structures between ponds will now be lined with two layers of HDPE with a leak collection sump. Solution occasionally reporting to the overflow pond will be pumped back to the process ponds as soon as possible after the condition causing the overflow has been corrected. Residence time of less than one month is anticipated.

Monitoring of ground water and the vadose zone is discussed in Appendix D. Contingency and remediation plans for leaks and spills are discussed in Section 2.1.7.4.

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[4] Sergent, Hauskins & Beckwith, Preliminary Permitting Studies, August, 1989.

[5] Metcon Research Inc., Sanchez Project Percolation Rate Studies, October, 1989.

[6] Vector Engineering, Inc., Sanchez Copper Heap Leaching Project, August, 1992.

APPENDIX F

U.S. ARMY CORPS OF ENGINEERS
SECTION 404 PERMIT
WATERS OF THE UNITED STATES

Section 404 Permit
Sanchez Copper Project

Section 404 Permit Requirements

On January 20, 1992 a Section 404 Permit Application (No. 92-206-CL) was submitted to the U.S. Army Corps of Engineers (Corps). The Corps issued their Section 404 Public Notice in July, 1992 with a closing date of August 24, 1992 for the Comment Period.

In accordance with Section 401 instructions from the Corps, a document entitled "Applicants Response to Arizona Water Quality Control Council Policy for Construction and Related Activities in Water, Adopted April 13, 1977" was submitted to the ADEQ on August 18, 1992.

The proposed project will comply with the <u>Federal Guidelines for Specification for Disposal Sites of Dredged or Fill Materials</u> (40 CFR 230). Impacted Waters of the U.S. in the project area are shown on Figure 1 of this appendix. The primary impacts will be from the open pit (3.4 acres), waste dumps (7.1 acres) and leach pad (2.6 acres). The location of the open pit is established as a result of the copper mineralization; therefore, alternative locations are not possible. Ore grades are relatively low (0.34 average percent copper), so a viable underground mining project is not an option.

The proposed locations for the waste dumps and leach pad were selected on the basis of environmental compatibility and operational feasibility. An alternatives analysis has been submitted to the Corps. Based on examination of the project vicinity, eight waste dump locations and four leach pad locations were given detailed consideration. Factors associated with eliminating sites from further consideration included: area of Waters of the U.S. impacted, avoidance of biologically and archaeologically sensitive sites, visual impact, anticipated erosional stability, containment of spills, minimizing heavy truck traffic near existing residences, and operational and economic feasibility.

Management of Surface Runoff During Construction, Operation and After Closure

As indicated in Table 1 of this appendix, approximately 1,400 acres of land will be disturbed as a result of the Sanchez Copper Project. The specific areas of disturbance are identified on the General Site Plan, Figure 1 of this appendix. As currently conceived, the project will impact a total of 14.1 acres of normally dry washes identified as jurisdictional Waters of the United States. The individual areas impacted by the various project facilities are also indicated in Table 1 of this appendix.

Before clearing and construction is begun, channels will be constructed as appropriate to intercept surface runoff from upgradient undisturbed areas and divert it around the areas to be disturbed. This flow will be routed to existing natural channels. In general, runoff will be routed to the main channel which would have received the flow prior to disturbance.

Where diverting the runoff is not feasible due to topography, such as along the northeast boundary of the main waste dump, the flow will be impounded and allowed to infiltrate or evaporate. Diversion channels are indicated on the General Site Plan.

Interceptor channels and containment structures will be constructed as appropriate down-gradient of areas to be disturbed to collect runoff from these areas. Runoff water collected on the downstream side of disturbed areas will be retained and allowed to infiltrate or evaporate. Based on testing of waste rock, there are no indications that infiltrating water will degrade groundwater quality. During the use of these structures, however, water collected will be sampled and analyzed as appropriate. With the exception of small areas such as access roads, it is planned that runoff from all disturbed areas will be collected and managed in the indicated manner. Runoff from the waste rock dump will be collected in ponds below the waste dump as shown on the General Site Plan.

Once the pit has been developed below ground level (end of year 1), there will be no runoff from the pit. Runoff from small disturbed areas surrounding the pit will be directed into the pit. Small collection ponds will be placed below the mine shop, office, crushing plant and conveyor as appropriate.

Runoff from the leach pad will be contained on the lined pad and in lined ponds. SX-EW plant drainage will be directed into the lined raffinate pond.

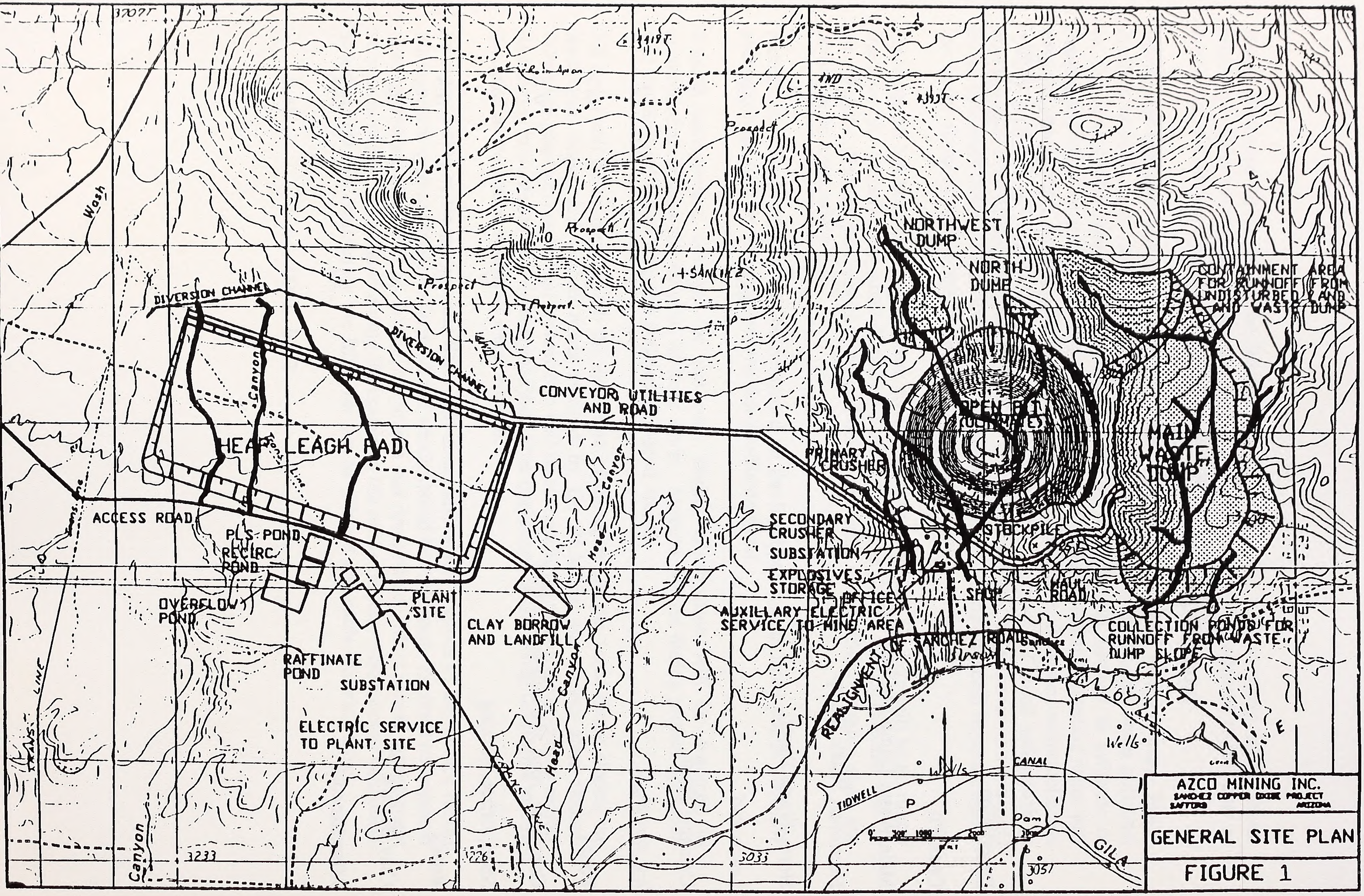
Runoff management systems for use only during construction will be designed to accommodate at least the 10-year, 24-hour storm. Systems for use during project operation will be designed for at least the 100-year, 24-hour storm.

All areas will be reclaimed with the exception of the open pit, the waste dump slopes, the leach pad slopes and limited roads retained by the BLM for site access after closure. Wherever possible, concurrent reclamation will be accomplished during the operating period. Remaining reclamation will be accomplished after operations cease. Final landforms will be designed to minimize wind and water erosion.

Prior to closure of the project, the BLM will determine which portions of the surface runoff management system should be retained and which should be reclaimed. Portions not required after operations cease will be graded, contoured and revegetated. Most runoff management structures will be revegetated during the operating life of the project. Some runoff catchment structures may be retained by the BLM for use as wildlife and cattle watering tanks.

Table 1
AREAS OF DISTURBANCE AND
IMPACTED WATERS OF THE UNITED STATES
SANCHEZ COPPER PROJECT

Description	Area Disturbed (acres)	Impacted Waters of the U.S. (acres)
Open Pit	277	3.4
Main Waste Dump and haul road	450	5.4
Northwest Waste Dump	33	1.7
North Waste Dump	4	0
Leach Pad	484	2.6
Crushing Plant	11	0
SX-EW Plant	9	0
Ponds	20	0.1
Conveyor, road and utilities corridor	36	0.3
Shop, office, parking	15	0
Roads	30	0.4
Clay Borrow Pit	11	0
Miscellaneous	20	0.2
Total	1400	14.1


NORTHWEST DUMP
NORTH DUMP
CONTAINMENT AREA FOR RUNNOFF FROM UNDISTURBED LAND AND WASTE DUMP
DIVERSION CHANNEL
DIVERSION CHANNEL
CONVEYOR, UTILITIES AND ROAD
HEAP LEACH PAD
PRIMARY CRUSHER
MAIN WASTE DUMP
ACCESS ROAD
PLS POND
RECIRC. POND
OVERFLOW POND
PLANT SITE
CLAY BORROW AND LANDFILL
RAFFINATE POND
SUBSTATION
ELECTRIC SERVICE TO PLANT SITE
SECONDARY CRUSHER
SUBSTATION
EXPLOSIVES STORAGE
OFFICE
SHOP
STOCKPILE
HAUL ROAD
AUXILLARY ELECTRIC SERVICE TO MINE AREA
REALIGNMENT OF SANCHEZ ROAD
COLLECTION PONDS FOR RUNNOFF FROM WASTE DUMP SLOPE
Wash
Canyon
TIDWELL
CANAL
GILA
3233
5033
3057
AZCO MINING INC.
SANCHEZ COPPER OXIDE PROJECT
SAFFORD ARIZONA
GENERAL SITE PLAN
FIGURE 1

APPENDIX G

CULTURAL RESOURCE COMPLIANCE

United States Department of the Interior

TAKE PRIDE IN AMERICA

BUREAU OF LAND MANAGEMENT
SAFFORD DISTRICT OFFICE
425 E. 4TH STREET
SAFFORD, ARIZONA 85546
(602) 428-4040

IN REPLY REFER TO:
8100
(045)

September 19, 1991

Mr. Bob Gasser
Compliance Coordinator
Historic Preservation Office
800 Washington, Suite 415
Phoenix, Arizona 85007

Dear Mr. Gasser:

Enclosed are copies of one research design and 2 archaeological survey reports produced by SWCA, Inc. for Arizona Consultants and Investments. These documents describe cultural resource inventory of Bureau lands proposed for use as a copper mine near Sanchez, Arizona.

While the copper mine has been on again - off again for quite some time it now appears to be scheduled for development. It is appropriate, therefore, for our offices to initiate consultation in accordance with 36 CFR 800.4 (C).

SWCA, Inc. June 1989 report <u>A Class III Archaeological Survey of the Sanchez Copper project area</u> identifies 6 sites, 17 isolated occurrences, and 845 isolated artifacts.

The 1990 report, <u>An Archaeological Survey within the Sanchez Copper Project Area, Graham County, Arizona</u> records 13 sites and 141 isolated artifacts.

We submit the following determination for your review:

<u>1989 Report</u>

Sites AZCC:2:47 (previously recorded), AZCC:2:74, AZCC:2:75, AZCC:2:76 and AZCC:2:77 eligible under criterion (d) for their data potential to add to our understanding of Archaic and possibly Paleoindians use of the area.

Site AZCC:2:78 (historic) eligible under criteria (c) and (d) at the local and state level regarding Hispanic homesteading, agriculture, and irrigation in the Sanchez, Arizona vicinity (see attachment 7, 1989 report).

Seventeen (17) Isolated Occurrences - not eligible

Eight hundred forty five (845) Isolated Artifacts - not eligible

Sites AZCC:2:81, AZCC:2:82, AZCC:2:83, AZCC:2:84, AZCC:2:85, AZCC:2:86, AZCC:2:87, AZCC:2:88, AZCC:2:89, AZCC:2:90, AZCC:2:91, AZCC:2:92, AZCC:2:93 eligible under criterion (d) for potential to add to our knowledge of Archaic and possibly Paleoindian use of this area. Please note that while SWCA, Inc. suggests that sites AZCC:2:89 and AZCC:2:91 are probably not significant due to relatively small size, BLM feels that as part of a complex of sites with similar attributes these two sites assume significance.

One hundred forty one (141) Isolated artifacts - not eligible.

Please contact Manton Botsford, San Simon Area Archaeologist at 428-4040 to discuss these determinations or to request additional information.

Sincerely,

Meg Jensen

Meg Jensen
Gila Resource Area Manager

Enclosures

ARIZONA STATE PARKS

800 W. WASHINGTON
SUITE 415
PHOENIX, ARIZONA 85007
TELEPHONE 602-542-4174

October 21, 1991

Meg Jensen
Gila Resource Area Manager
DOI Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, AZ 85546

RE: Sanchez Copper Mine Project, DOI-BLM

Dear Ms. Jensen:

Thank you for consulting with us about the above project. I have reviewed the documentation that you submitted to us and have the following comments pursuant to our Programmatic Memorandum of Agreement:

We are in complete agreement as respects the National Register eligibility of all of the cultural resources that were identified as part of this project. We are pleased that the agency has viewed some of the small sites has having the potential to provide important information about the larger complex of sites; again, we completely agree with your logic.

We look forward to continuing our consultations on this project. If you have any questions, please contact me.

Sincerely,

Robert E. Gasser
Compliance Coordinator

for Shereen Lerner, Ph.D.
State Historic Preservation Officer

BUREAU OF LAND MANAGEMENT
SAFFORD DISTRICT OFFICE
425 E. 4th STREET
SAFFORD, ARIZONA 85546

(602) 428-4040

8100
(045)

Mr. Robert E. Gasser
Compliance Coordinator
Historic Preservation Office
800 Washington, Suite 415
Phoenix, Arizona 85007

JAN 23 1992

Dear Mr. Gasser:

Enclosed is a copy of SWCA, Inc. report <u>A Class III Archaeological Resource Inventory of Approximately 1440 Acres for the Sanchez Copper Project Area, Graham County, Arizona</u>. This report describes inventory of portions of the proposed Copper Mine not previously examined.

Seventeen new cultural sites are identified as a result of this inventory. BLM agrees with SWCA's recommendation that all these sites are eligible for listing on the National Register (criteria d). Potential exists for research to advance our knowledge of human use of this portion of the Gila Valley from the Archaic through the ceramic period.

BLM also agrees with the SWCA opinion that IO-1 is not eligible and its data potential is exhausted.

Please review these determinations and provide us with your comments.

Page 46 of SWCAs report informs the reader that a treatment plan is in preparation that will address the impacts of the Sanchez Mine on the cultural sites identified to date. BLM will continue to consult with your office, when the plan is ready, on the affects of mining to the sites and what steps will be taken to mitigate impacts.

Please call Manton Botsford, San Simon Area Archaeologist, at the above phone number to discuss these determinations or to request additional information.

Thank you for your cooperation.

Sincerely,

Margaret Jensen
Gila Resource Area Manager

Enclosure

ARIZONA
STATE
PARKS

800 W. WASHINGTON
SUITE 415
PHOENIX, ARIZONA 85007
TELEPHONE 602-542-4174

February 20, 1992

Margaret Jensen
Gila Resource Area Manager
DOI Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, AZ 85546

RE: Sanchez Copper Mine Project, DOI-BLM

Dear Ms. Jensen:

Thank you for consulting with us again about this project and sending us a copy of the most recent archaeological survey report prepared by SWCA, Inc. I have reviewed your submittal and have the following comments pursuant to our Programmatic Memorandum of Agreement:

1. I note that approximately 1440 acres were surveyed and a total of 17 newly recorded sites were identified.

2. Based on the information provided, we concur with the agency that all 17 sites are eligible for inclusion in the National Register of Historic Places. We also agree that the isolated occurrence is not National Register eligible.

3. In preparing the next submission, please address the potential for the possible habitation sites to contain human remains.

We look forward to continuing our consultations on this project. If you have any questions, please contact me.

Sincerely,

Robert E. Gasser
Compliance Coordinator

for Shereen Lerner, Ph.D.
State Historic Preservation Officer

FEB 2 4 1992

BUREAU OF LAND MANAGEMENT
SAFFORD DISTRICT OFFICE
425 E. 4th STREET
SAFFORD, ARIZONA 85546

(602) 428-4040 3809 AZA 25564 (044)

April 9, 1992

Mr. Raleigh Thompson
San Carlos Apache Tribe
P. O. Box O
San Carlos, Arizona 85550

Dear Mr. Thompson:

Enclosed is an extra copy of the Draft Environmental Impact Statement (DEIS) for the Sanchez open pit copper mine proposed by AZCO Mining, Inc.; a copy of this DEIS was sent to your office on March 6, 1992, and a copy of the Mining Plan of Operations was sent to the tribe (at Post Office Box D) last August.

We are interested in soliciting any comments or concerns the tribe may have regarding this project. For example, page 3 of the Summary states that the mine site would not affect any Native American religious concerns. That is true as far as we know, but we would feel more comfortable with the statement if we could get it confirmed by your office.

We need to have all comments on this DEIS postmarked no later than May 11, 1992; comments should be sent to Larry Thrasher at this office.

Please contact Mr. Thrasher if there are any questions on the enclosed.

Thank you.

Sincerely,

Elson Alvarez
Acting Gila Area Manager

1 Enclosure

BUREAU OF LAND MANAGEMENT
SAFFORD DISTRICT OFFICE
425 E. 4th STREET
SAFFORD, ARIZONA 85546

(602) 428-4040 AZA 25564 (044)

AUG 5 1992

Ms. Teresa Hoffman
Acting Chief of Historic Preservation Section
Arizona State Parks
800 W. Washington, Suite 415
Phoenix, Arizona 85007

Dear Ms. Hoffman:

Enclosed are copies of three archaeological survey reports and one comprehensive cultural resource mitigation plan (including an addendum) for the Sanchez Copper Project. The Bureau of Land Management, Safford District, requests your comments on our opinions regarding eligibility and no effect determinations suggested by these documents, per 36 CFR 800 and the General Consultation PMOA dated March 26, 1985. A project abstract is enclosed.

Six Class III cultural resource inventories have been completed for the Sanchez Copper Project area. The three enclosed reports complement the three previous survey reports forwarded to your office in September 1991 and January 1992:

1. SWCA's April 6, 1992 *Addendum A* (to one of the previously submitted SWCA surveys) reports that no additional sites were located during Class III survey of 86 acres. No sites were identified and there will be no effects on cultural resource values in this area. Please note that there is no "Addendum B."

2. SWCA's June 1992 *An Archaeological Resource Inventory of Two Alternate Access Routes for the Sanchez Copper Project Area, Graham County, Arizona* reports that two previously unrecorded sites were located and documented (AZ CC:2:138 & 139 [ASM]) along the southern alternative access route. Additionally, documentation for a third, previously recorded site (AZ CC:2:45 [BLM]) was enhanced.

   The southern access route surveyed is no longer an element of the Sanchez Copper Project. Sites AZ CC:2:138 & 139 are located well beyond the project boundary and are not addressed in the enclosed mitigation plan.

   AZ CC:2:45 (BLM) is a large Civilian Conservation Corps (CCC) work camp. It is our opinion that the site is eligible for listing on the National Register of Historic Places under criteria "a" and "d," and your opinion is solicited.

3. SWCA's July 1992 *An Archaeological Resource Inventory of an 82 Acre Plot and a Short Linear Segment for the Sanchez Copper Project Area, Graham*

County, Arizona reports the discovery of a single site, AZ CC:2:144 (ASM) and a number of CCC-constructed erosion-control features.

AZ CC:2:144 contains two diffuse rock concentrations and a lithic core. The site is believed to be potentially eligible for listing on the National Register under criterion "d."

In sum, the six SWCA surveys located and recorded 38 archaeological sites within the boundaries of the Sanchez Copper Project area of potential impacts: AZ CC:2:47, 74 through 78, 81 through 93, 120 through 136, and 144 (all ASM designations). Through previous SHPO consultation all of these sites--except 45 (BLM) and 144 (ASM)--have been determined to be potentially eligible for nomination to the National Register, pending the results of the enclosed mitigation plan.

The 38 sites addressed in SWCA's July 1992 ***Proposal for Archaeological Studies for the Sanchez Copper Project, Graham County, Arizona*** (also enclosed) include mitigative actions for the CCC camp (AZ CC:2:45 [BLM]). The site is outside of the area of the Sanchez Copper Project's direct impacts. However, because the camp may suffer indirect adverse effects through increased visitation, and because the project will disturb erosion control devices associated with the camp, the enclosed mitigation proposal specifies measures for mitigating these impacts.

Finally, in response to a question posed in Mr. Gasser's letter of January 20, 1992, and as discussed on page 34 of the mitigation proposal, it is unlikely that human remains will be encountered during the course of data recovery.

It is BLM's determination that the combination of recording of baseline site data, data recovery, and site avoidance proposed in SWCA's mitigation plan will constitute No Effect on cultural resource values in and around the project area. We request your opinion on this determination. If you have any questions, please contact John Welch at this office.

Sincerely,

Vernon L. S[illegible]

William T. Civish
District Manager

5 Enclosures

cc: Mr. David C. Beling
880 Twin Pines Road
Reno, Nevada 89509

UNITED STATES GOVERNMENT

memorandum

Office of the Superintendent
(602) 475-2322

DATE: AUG 20 1992

REPLY TO ATTN OF: Superintendent, San Carlos Agency

SUBJECT: AZCO Mine Proposal

TO: Bureau of Land Management
Attention: Safford District Manager

It was good to meet you at the San Carlos Council meeting on August 19 and I would like to welcome you to Arizona. As members of the Department of the Interior "team", the Bureau of Indian Affairs (BIA) and Bureau of Land Management (BLM) must strive to represent the trust responsibility the United States has to Indian tribal governments. I am confident that you and I, as the local line officers of our respective organizations, can forge a working relationship to better serve our customers.

As we discussed at the August 19, Council meeting, we are concerned that the proposed AZCO copper mine may directly or indirectly impact the quantity and quality of the water in the Gila River. As explained in the meeting the southern rim of the open pit will be approximately one-fourth mile north of the Gila River, and the bottom of the pit will be dug to a depth that will be well below the present elevation of the river. While we understand the plans call for safeguards and contingencies to ensure the integrity of the Gila River will be maintained, as trustee to the San Carlos Apache Tribe, the Department of the Interior as represented by the BLM and BIA must be absolutely certain before this project can be supported.

As committed in the above mentioned meeting, we look forward to reviewing the final EIS which will now include a discussion about the water quantity and quality issues of concern to the BIA and the Tribe.

Again, welcome to Arizona and feel free to call if you have any questions on this or any other matter.

Allen J. Anspach

ARIZONA
STATE
PARKS

800 W. WASHINGTON
SUITE 415
PHOENIX, ARIZONA 85007
TELEPHONE 602-542-4174

September 2, 1992

William T. Civish
District Manager
DOI Bureau of Land Management
Safford District Office
425 E. 4th Street
Safford, AZ 85546

RE: Sanchez Copper Mine Project, DOI-BLM

Dear Mr. Civish:

Thank you for consulting with us again about the above project and sending us copies of three additional survey reports and the archaeological data recovery proposal prepared by SWCA, Inc. for the above project. I have reviewed your submittals and have the following comments pursuant to our Programmatic Memorandum of Agreement (PMOA):

1. We concur with the agency about all of the National Register eligibility determinations but want to emphasize that under the regulations these sites have to be treated as National Register eligible, not potentially eligible.

2. I have reviewed the data recovery proposal and find that despite its ambitious and perhaps somewhat unrealistic research goals, it is acceptable as written. Implementation of the data recovery program should mitigate pursuant to 36 CFR 800.9(c)(1) any adverse direct and indirect effects to these sites resulting from the proposed mining activities and increased use of the area. The agency requested a determination of "no effect" for the project; this is inappropriate since the historic properties will be altered (some will be destroyed) by the proposed undertaking. Since there is little or no likelihood that human remains will be impacted, the proper determination of effect should be "no adverse effect" which is covered under the PMOA without Advisory Council review provided that the agency and our office are in agreement. We trust that you will concur with our determination of no adverse effect; please advise if such is not the case.

We look forward to reviewing the results of the data recovery activities and appreciate your continued cooperation with our office in complying with our PMOA. We appreciate your continued cooperation with this office in complying with the historic preservation requirements for Federal undertakings. If you have any questions, please contact me or Teresa Hoffman, Acting Chief, Historic Preservation Section at 542-4174 or 542-4009.

Sincerely,

Robert E. Gasser
Compliance Coordinator

United States Department of the Interior

TAKE PRIDE IN AMERICA

BUREAU OF LAND MANAGEMENT
Safford District Office
425 E. 4th Street
Safford, Arizona 85546

(602) 428-4040

IN REPLY REFER TO:
7200 (043)

CERTIFIED MAIL NO. P 110 852 267
RETURN RECEIPT REQUESTED

Mr. Raleigh Thompson, Chairman
San Carlos Apache Tribe
P.O. Box O
San Carlos, Arizona 85550

NOV 02 1992

Dear Mr. Thompson:

The Bureau of Land Management has received an application requesting authorization to conduct archaeological investigations on sites in the AZCO Mining Company's Sanchez Copper Mine project area. The project area is located five miles northeast of Safford, Arizona. A map is enclosed for your reference.

The archaeological studies would consist of site mapping, artifact collecting, and excavation of a sample of archaeological features and artifact concentrations at thirty-eight sites. These sites consist primarily of sparse artifact scatters and agricultural fields. Most appear to be Archaic (8,000 B.C. - 1 A.D.); three contain ceramics; and two are historic sites. No village sites are present and no burials are expected to be present. The purpose of the archaeological studies is to mitigate the potential impact of the proposed copper mine on the sites' scientific values.

In accordance with the Archaeological Resources Protection Act Section 4 (c), its implementing regulations at 43 CFR 7.7 (a), and the Native American Graves Protection and Repatriation Act of 1990, we are notifying you of our intent to issue the permit. We request you notify us at your earliest convenience if there are sites or areas of tribal religious or cultural importance in the project area and if you have concerns with issuance of the permit. You or a designated tribal official may request a consultation with the District Manager within 30 days of receipt of this notice. If we have not received a response from you within 30 days, we will proceed with processing the permit application. Please contact Gay Kinkade of our office by phone if you have any questions.

Sincerely,

William T. Civish
District Manager

1 Enclosure